VOLUME 40
NUMBER 1

JANUARY, 1953

plating

POSTMASTER: IF UNDELIVERABLE RETURN TO
5300 N. MERVINE ST., PHILADELPHIA 41, PA.
RETURN POSTAGE GUARANTEED

BORIC ACID PROCEDURE

See Contents Page 39

are you finishing ? ZINC BASE CASTINGS ? WITH CLEPO PRODUCTS

CLEPO 135-H	Soak Cleaner for removal of Oil, Buffing Compounds, Etc.
CLEPO 50-K	Heavy duty reverse Electrocleaner for Buffed Work
CLEPO 51-H	Direct Electrocleaner for Buffed Parts
CLEPO No. 9	Process Cleaner and chip remover after machining operation
CLEPO 85-AN	Spray Wash-machine Cleaner
CLEPO 15-S (Coarse), CLEPO 15-W (Medium), CLEPO 171-A (Light)	Deburring Compound
CLEPO 191-K	Shine Roll Compound after Deburring
Z.P.A.	Whitening dip for Zinc base before Barrel Burnishing
CLEPO 164-Z	Ball Burnishing Compound

Contact your Clepo Representative for a Demonstration of these Clepo Products

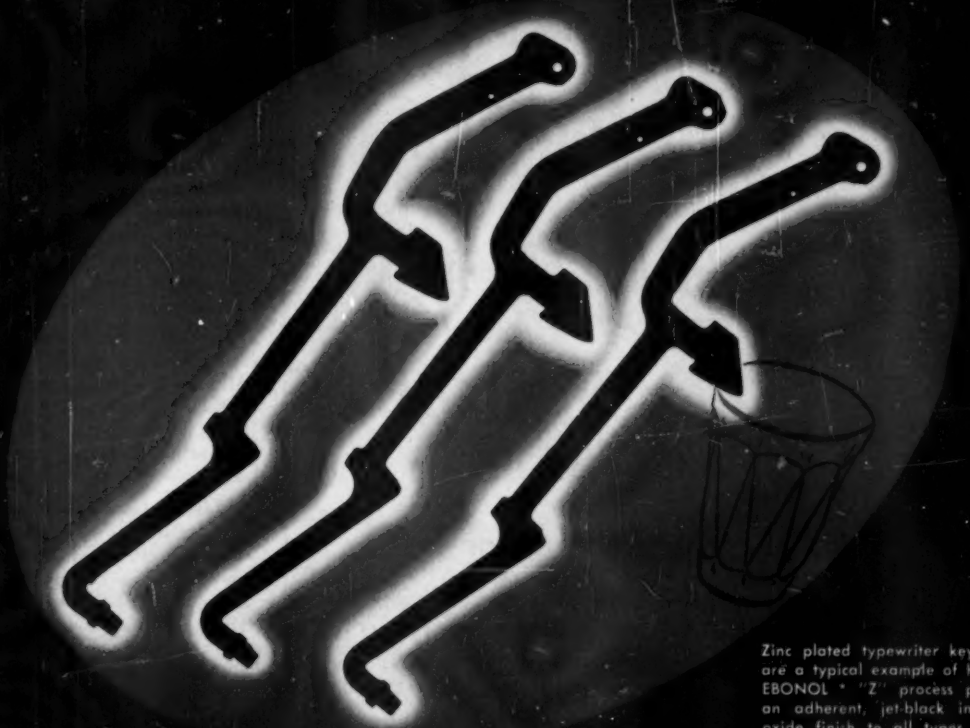
CLEPO — CLEANING COMPOUNDS

FREDERICK **GUMM** *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A 10C.

JET BLACKS



Zinc plated typewriter key levers are a typical example of how the EBONOL * "Z" process provides an adherent, jet-black inorganic oxide finish to all types of zinc plated surfaces.

*Reg. Trade Mark

For blackening metals use ENTHONE EBONOLS

EBONOL "S" Processes for blackening steel to produce jet-black oxide coatings. Simple and economical to operate. Operating temperatures: EBONOL "S", 285-290°F., EBONOL "S-30", 295-305°F.

EBONOL "C" The quality black for copper and brass that meets all military specifications. Produces cupric oxide finishes that are stable, adherent and protective.

EBONOL "Z" A durable, deep, rich finish for zinc plate or zinc alloy castings. Dull or glossy oxide black coatings are formed in from 5 to 10 minutes at 160-180°F.

U. S. PATENT NOS. 2,364,993, 2,460,896, 2,460,898, 2,481,854.

Write to Enthone, Inc. for information and advice on any blackening process and ask for check list of Enthone literature on over sixty products and processes for better electroplating and metal finishing.

METAL FINISHING PROCESSES

ENTHONE
INCORPORATED

ELECTROPLATING CHEMICALS

442 ELM STREET
NEW HAVEN, CONNECTICUT

Put them INTO your Plating!

Get more and better plating for less

With complete control of the sequence plus the conveyor handling of the parts, a Meaker machine gives greater production, reduced costs, uniform predetermined quality and less turnover in personnel due to better working conditions. Meaker equipment is tailored to the job requirements in plating, anodizing, pickling and cleaning, bonderizing or other processes involving a sequence of washes, rinses, and dips. Get full particulars from The Meaker Company, 1629 South 55th Avenue, Chicago 50, Illinois.

MEAKER

- Full Automatic and Semi-Automatic Electroplating Equipment
- Strip Steel Plating Equipment
- Wire Galvanizing Equipment
- Strip Steel Electrocleaning Lines
- Pickling Machines
- Processing Conveyors
- Motor Generators for Plating
- Rectifiers for Plating

MEAKER PRODUCTS

Meaker Return-Type Automatic Plating Machine

PLATING EQUIPMENT FOR OVER 50 YEARS

In This Issue

Better Electroplating Practice by Joseph B. Kushner is a general interest paper discussing the psychological aspects of some worker attitudes in the metal finishing industry, and suggests methods for the improvement of those attitudes.

Polarographic Determination of Tin in Tin Plating Solutions by Rafael Diaz. A paper which describes a method which seems to give excellent results in the determination of tin. This technique for speeding up plating solution analysis where polarographic equipment is available should be of interest to the industry.

Practical Experiences with Chromium Without Nickel Undercoats by D. Cam is a paper which describes results of the use of "cold" chromium plate on brass steel parts. A table of accelerated corrosion test results from use of the process is included.

Colorless Lacquers by J. Towner is a paper that details various considerations that enter into the problem of the development of an organic coating suitable for application over chromium or bright zinc electrodeposits. This paper like that by D. Cam is one of several that were presented this past spring at the Melbourne Branch A. E. S. Conference.

A Theory of Hydrogen Overvoltage and Its Relation to the Electrodeposition of Metals by George Dubpernell and Roberta Dubpernell is part one of a paper in which it is suggested that hydrogen overvoltage is probably not due to hydrogen at all, but to the electrodeposition of minute traces of alkali metals such as sodium.

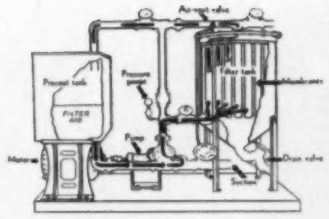
The Determination of Boric Acid in Nickel Plating Baths by Dr. E. J. Serfass, R. B. Freeman and E. Pritchard is the first in a series of Research Papers on the determination of plating constituents occurring in macro amounts. The paper describes a method wherein nickel is precipitated as ferrocyanide. Then without filtration of the precipitate, the boric acid is determined by first titrating with standard alkali to a bromcresol purple endpoint, and after conversion of the weak tribasic acid to a strong monobasic acid followed by titration with standard alkali again to a phenolphthalein endpoint the procedure is completed.

For page number, see Table of Contents, page 39

Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years 50c per copy; Foreign, $8.00 per year, $1.00 per copy.

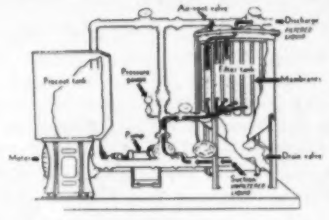
PRECOATING

requires only minutes. Filter-Aid is evenly distributed. No time waste . . . no material waste.



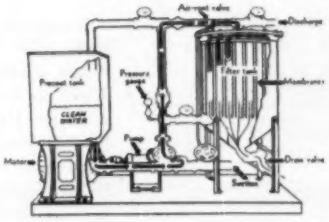
FILTERING

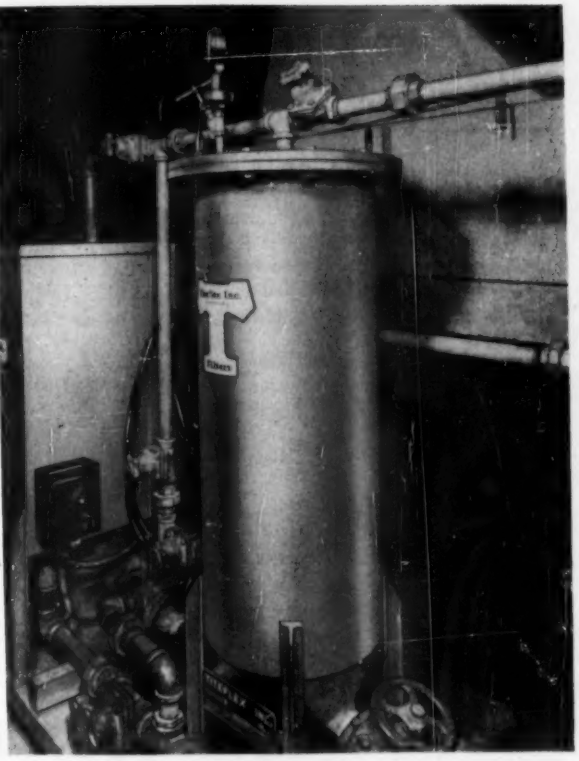
is simple . . . sure. Suspended particles down to 1/10 micron are removed. Color . . . taste . . . smell . . . chemical composition are unaffected.



CLEANING

is fast . . . easy. Simple reversal of flow for backwashing at pressures up to 100 psi insures complete cake-break-up. Cleaning is complete in minutes . . . no manual removal of residue.





Titeflex filter installation in filter department at Stromberg–Carlson, Rochester, N. Y.

How Titeflex Simplicity Saves Time and Money for STROMBERG-CARLSON

Removal of anode sludge from Zn $(CN)_2$ type bath in Stromberg-Carlson's Zinc Plating operation has been no problem since they installed a Titeflex filter.

Simplicity Keynotes Operation

Real economy results from Titeflex simplicity. They save time because filter can be cleaned easily, in minutes, on a daily basis. They save money because no replacement of filter-bags or other elements is needed. They save on rejections because daily cleaning results in better, more uniform plating.

Titeflex Filters Can Help you

For every filtering operation large or small there is a Titeflex filter to do the job — and do it better. Capacities from 200-1000 G.P.H. up . . . filter areas from 5 to 450 square feet are available as standard construction or on special order. Find out more about Titeflex filters . . . and what they can do for you . . . today. Clip and mail the coupon for complete information without obligation.

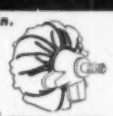
Let Our Family of Products Help Yours

Titeflex

✓ Check products you are interested in.

☐ SEAMED AND SEAMLESS METAL HOSE

☐ PRECISION BELLOWS

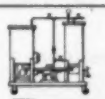


☐ IGNITION HARNESS

☐ IGNITION SHIELDING

☐ ELECTRICAL CONNECTORS

☐ RIGID AND FLEXIBLE WAVE GUIDES



☐ FILTERS

☐ FUSES

TITEFLEX, INC.
533 Frelinghuysen Ave.
Newark 5, N.J.

Please send me without cost information about the products checked at the left.

MAIL COUPON TODAY

NAME _____

TITLE _____

FIRM _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

Industry News

Young Purchases the Apley N. Austin Company. Dr. C. B. F. Young, consulting electrometallurgist, has purchased the Apley N. Austin Company of Pequabuck, Conn. This company manufactures a complete line of polishing and buffing compounds and also manufactures alkali cleaners.

Dr. Young will devote his time to the improvement of the products of the Apley N. Austin Company and Mr. Austin will continue to function in his capacity as Vice-President and General Manager of the company which he founded some twenty-five years ago.

Arrow Plating Company, Inc., Chicago, celebrates grand opening of ultra-modern job shop with open house. Left to right: Verna Walker, Arthur C. Sherwin, Arrow Plating Company General Manager; William Holzendorf, Berteau-Lowell Plating Works; John William Carlson, Mrs. Anna V. Carlson, Orville Kocour, Kocour Company; John E. Carlson, President Arrow Plating Company; Art Engdahl, Kocour Company, and Margaret Steiner

ARE YOU CHEATING YOURSELF...

out of brighter, finer zinc and cadmium plating at lower cost by not trying the new ARP Plating Brighteners in your own plant? If you've not tried them call in your Iridite field engineer today for test samples. Or, write direct to

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

REPRESENTATIVES IN PRINCIPAL INDUSTRIAL CITIES; West Coast: L. H. BUTCHER COMPANY

Manufacturers of Iridite Finishes
for Corrosion Resistance and Paint Systems for Non-Ferrous Metals; ARP Plating Chemicals.

Hanson-Van Winkle-Munning Sponsors Fellowship at Michigan State College. Hanson-Van Winkle-Munning Company, Matawan, N. J., announces the sponsorship of a graduate fellowship as part of its continuing long-range policy of promoting the study of fundamental research in electroplating and allied fields. **Joseph M. Tobin** is the new fellow, elected by the faculty at Michigan State College. He will study the "Diffusion Rates of Gases Through Metal Films".

Administration of the fellowship is under the direction of **Dr. D. T. Ewing** of Michigan State College. **Russel H. Fay,** recipient of the fellowship for the past three years, is now a teaching assistant in the College's Physical Chemistry Department.

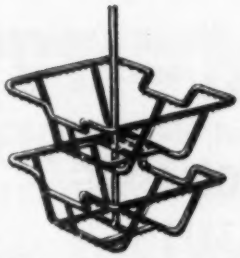
New Plant for Lindberg Steel Treating Company. Lindberg Steel Treating Company has expanded its Los Angeles facilities with the formal opening of a new plant located at 2910 Sunol Dr. The new quarters with 14,000 square feet of floor space triples the capacity of the company's former plant acquired in 1948.

More than thirty furnaces and heat treating units are being installed to permit the company to handle a wide range of specialized work, as well as standard production heat treating jobs. This equipment includes controlled atmosphere hardening furnaces, tempering furnaces, hydrogen annealing furnaces, as well as equipment for Malcomizing, nitriding, induction hardening, flame hardening, sand blasting and liquid honing.

Free Course in Electroplating. The Spring term for the course in Electroplating from February to June at the Brooklyn Evening Technical High School, 29 Fort Greene Place, Brooklyn, N. Y., will begin on February 2, 1953.

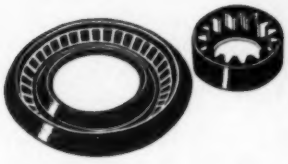
The course includes a review of elemen-

AMAZING TENSILE STRENGTH



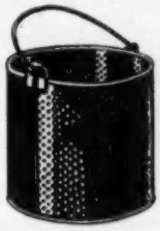
PERMANENT FLEXIBILITY

CONTINUOUS ADHESION



RUGGED SCUFF RESISTANCE

POSITIVE INSULATION



DURABLE PROTECTION

When...

THEY'RE MICCROSOL COATED

They Meet the Highest Industrial Standards

MICCROSOL E-1003 Heat-Cured Rack Coating is a 100% solids, non-evaporating material that produces a smooth, tough, leather-like coating which will often outlast the rack. Exceptional adhesion is achieved through the use of our primers.

In addition to the outstanding characteristics listed above, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show superior performance in comparison to similar products. MICCROSOL E-1003 has proven to excell as a coating for materials-handling equipment, baskets, hangers, and a wide variety of plating equipment parts.

MICCROSOL E-1003 has an exceptionally high gloss, allowing free drainage, and no solution carry-over.

We will be pleased to help you with your coating problems. Send us full particulars.

MICCRO Products

MICHIGAN CHROME

and Chemical Company

6351 East Jefferson Avenue • Detroit 7, Michigan

AMERICAN CHEMICAL PAINT COMPANY
AMBLER ACP PENNA.

Technical Service Data Sheet
Subject: *GRANODIZING** FOR LONG PAINT LIFE ON STEEL

"GRANODINE" FORMS A DURABLE PAINT BOND

Granodizing forms a crystalline, zinc phosphate coating on steel. This ACP paint-bonding process chemically changes the surface of steel into an inert non-metallic coating made up of thousands of microscopic zinc phosphate crystals.

Granodized steel thus presents a surface much more receptive to paint than untreated steel. Its crystalline structure permits a firm and durable "keying" or bonding of the paint finish. And the "Granodine" zinc phosphate coating itself is actually integral with the metal from which it is formed.

"GRANODINE" CAN BE APPLIED BY DIPPING, SPRAYING OR BRUSHING

Granodizing can be accomplished by:

1 Dipping the work in tanks;
2 Spraying the parts in a power washer; or
3 Brushing, spraying, or flow-coating the work with portable hand equipment.

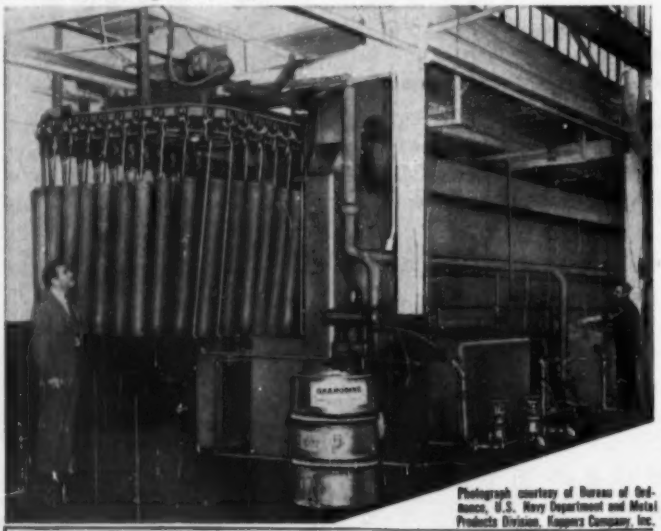
Choice of process is usually decided by such factors as the size, nature, and volume of production.

"GRANODINE" STANDARD PRACTICE ON BOTH CIVILIAN AND MILITARY PRODUCTS

Automobile bodies and sheet metal parts, refrigerators, washing machines, cabinets, etc.; projectiles, rockets, bombs, tanks, trucks, jeeps, containers for small arms, cartridge tanks, 5-gallon gasoline containers, vehicular sheet metal, steel drums and, in general, products constructed of cold-rolled steel in large and continuous production are typical of the many products whose paint finish is protected by "Granodine".

In military production, "Granodine" is used to obtain a zinc phosphate finish meeting Grade I of JAN-C-490 and equivalent requirements of other specifications.

*"GRANODINE" Trade Mark Reg. U.S. Pat. Off.



Photograph courtesy of Bureau of Ordnance, U.S. Navy Department and Metal Products Division, Koppers Company, Inc.

Typical power spray washing machine for the automatic application of a protective phosphate coating to metal parts in preparation for painting. These 5" rocket motor tubes, as well as products made of cold rolled sheet steel, are effectively phosphate coated in such equipment.

CHEMICALS ACP PROCESSES

Industry News

tary chemistry, calculations for the preparation of standard solutions, specific gravity, neutralization, *p*H, hydrolysis, and similar related topics. Laboratory experiments will include analysis of copper, nickel, chromium, and silver baths; chemical and physical tests of electrodeposits, Ohm's law and current efficiency.

Registration for the course begins the week of January 15, 1953 from 7:00 P. M. to 9:00 P. M. Classes will meet Monday and Wednesday 6:45 P. M. to 8:15 P. M. and about 6:00 P. M. Friday. Ask for Mr. L. Serota in Room BW17 February 2–3 and in Room 3E10 thereafter. The course is limited to men in the electroplating industry.

L. H. Butcher Expansion. In keeping with its expansion policy, the L. H. Butcher Company, Udylite Corporation subsidiary, is going to erect a new building in Los Angeles to house its manufacturing facilities as well as to enlarge their laboratory facilities.

The new building will also house the manufacturing unit for buffing and polishing compounds and will offer expanded production facilities for Enthone, Allied Research and Udylite products.

Anaconda Aluminum Company Formed. Anaconda Copper Mining Company has announced the completion of the organization of its subsidiary, Anaconda Aluminum Company (formerly Harvey Machine Co., Inc. of Montana). Mr. Francis D. Case, who is a vice-president of Anaconda Copper Mining Company, has been elected president of Anaconda Aluminum Company.

An aluminum reduction plant scheduled for completion early in 1954 will be built near Columbia Falls, at the base of Teakettle Mountain, in Flathead County, Mont. Two pot-lines together with accessory buildings and equipment, capable of producing 50,000 tons of aluminum annually, will be installed.

Battelle Institute Builds in Germany. The cornerstone for a new research center at Frankfurt/Main, in Germany, to serve the industry of that country, was placed in a recent ceremony. The new Battelle Memorial Institute for Germany is being established by Battelle Memorial Institute, Columbus, Ohio.

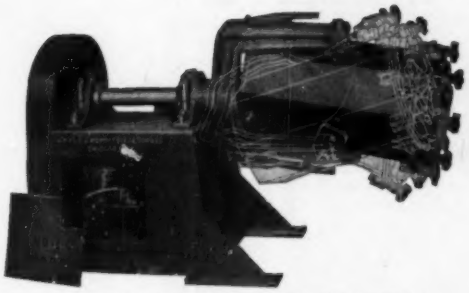
Simultaneously Battelle Director Clyde Williams announced that Battelle is establishing another research center at Geneva, Switzerland, and has set up a program of fellowships for selected students in the universities of both Switzerland and Germany. In addition, research centers and fellowship programs for other countries of Western Europe are contemplated for the future.

USE "RELIANCE" PRODUCTS FOR

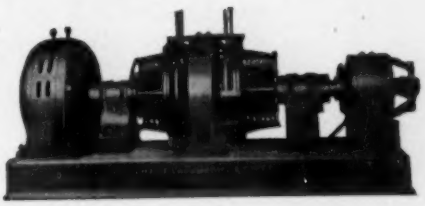
ECONOMY : EFFICIENCY : DEPENDABILITY

LET US SUPPLY YOUR NEEDS FOR YOUR PLATING OR POLISHING DEPARTMENT

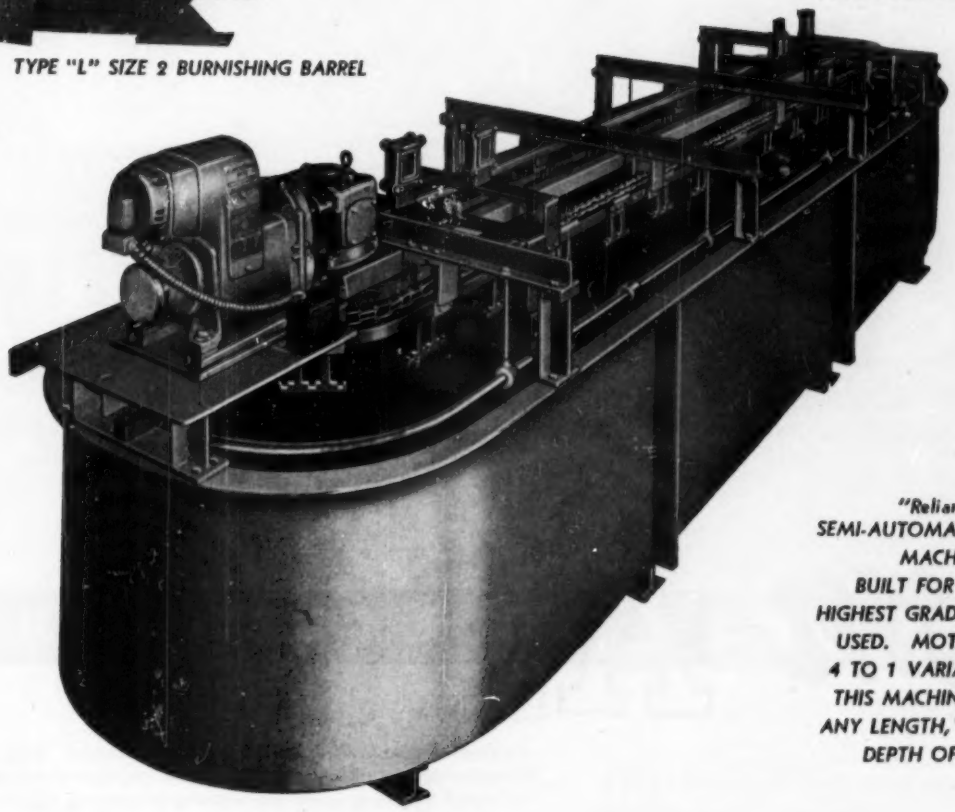
WRITE FOR FURTHER DETAILS



TYPE "L" SIZE 2 BURNISHING BARREL



3000 AMP. 6 VOLT GENERATOR SET



"Reliance"
SEMI-AUTOMATIC PLATING
MACHINE
BUILT FOR SERVICE
HIGHEST GRADE MATERIAL
USED. MOTOR ½ HP
4 TO 1 VARIABLE SPEED.
THIS MACHINE IS BUILT
ANY LENGTH, WIDTH AND
DEPTH OF TANK.

Chas. F. L'Hommedieu & Sons Co.

MANUFACTURERS of

Plating and Polishing Machinery

Complete Plating Plants Furnished

Chas. B. Little Co.
Newark, N. J.

W. R. Shields
Detroit, Mich.

O. M. Shoe
Philadelphia, Pa.

Gen. Office and Factory:
4521 Ogden Ave.

CHICAGO

Branches:
Cleveland
and
Los Angeles

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 107.

ELECTRO-PLATING REQUIREMENTS

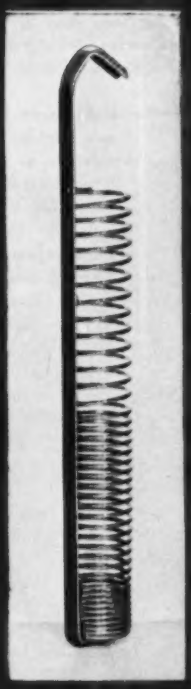
from ANODE CONTAINERS

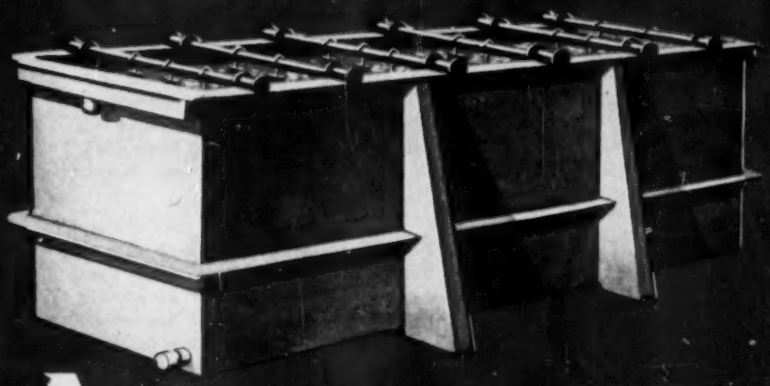
Anode production facilities here at Wagner Brothers are designed to maintain our reputation for providing none but *premium* products, the highest degree of purity in the plating industry. All types are available, promptly, in the following metals:

● Nickel, Iso-Cast Oval form, cast to give optimum grain size, any length. ● Copper, the famous Flat-Top, smooth surfaced, free from silicon, dirt and oxides; Lectrocop, pure electrolytically deposited slab form, any width or length, the lowest cost form of anode; Iso-Cast Oval, electrolytic copper molded under controls eliminating ferrous contamination. ● Zinc, in the *new standard* form, Flat-Top, easily identified, clean, cast from the purest metal. ● Tin, cadmium, available in any length in the distinctive

INDICATE A 108.

Wagner



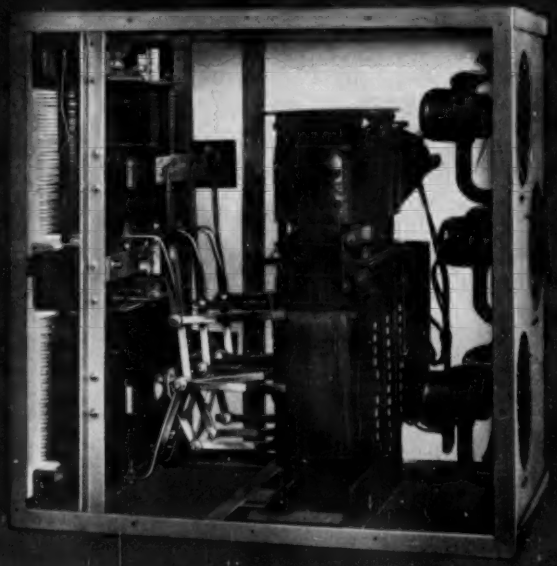


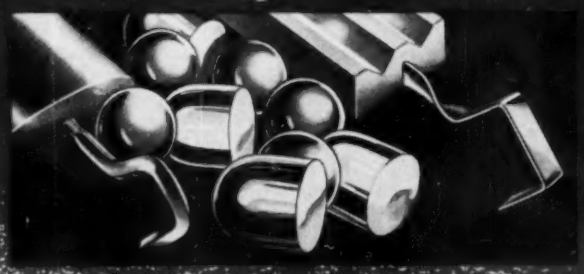
DOUBLE WELDED TANKS, all sizes, all types of linings, to your design or ours. Agitators, single or double cathode bars, as required.

ANODE CONTAINER with spline welded full length, has 4-point contact. Plate at bottom catches "nubs", permits free circulation of solution. Close spacing of coils avoids jamming of anodes. Special lengths and curved containers fabricated promptly. Standard sizes in stock.

WAGNER-TIEDEMAN RECTIFIER with back panels removed showing easy access and simplicity. Note three low-velocity cooling fans.

WAGNER ANODES in all metals are recognized as standards of the industry. Every Wagner Anode is a premium product.





to ZINC SOLUTIONS

corrugated Iso-Cast form with locked in steel contact hook. Balls are also available. ● White brass, 80% zinc, 20% copper, available in several shapes, as required.

Wagner-Tiedeman Electroplating Rectifiers have earned a place along with other Wagner premium products. Our ratings are conservative for full efficiency and safe performance. Removable panels permit quick and easy access. Ranges are from 2 to 50 volt, 750 to 10,000 or more amperes.

Wagner tanks are being incorporated in outstanding automatic and still tank operations everywhere. We're shipping to users far from our plant and the reason is simple: our tanks are built to last, our price is fair and we are ready to handle any quantity, one or one hundred, equipped with agitators and rods as required—or we'll provide your complete plating set-up, automatic or still tank.

Along with these products and the solutions, supplies and equipment for a complete electroplating system, we offer a competent sales-and-service staff. The Wagner representatives and branch managers are men with production experience and years of electroplating engineering behind them. They are backed up by an efficient laboratory and pilot plant, manned by some of the best technicians in the industry. Most important of all, you'll find every Wagner man enthusiastic about providing service to his clients and anxious to prove his ability and the integrity of the company he represents. Want proof? Pick up the phone and tell us your troubles or drop us a line at your first opportunity.

BROTHERS, INC. • 425 MIDLAND AVE., DETROIT 3

CHICAGO • CINCINNATI • ROCHESTER

Industry News

The Frankfurt research center will engage in chemical, metallurgical, and engineering research. Under construction on a site presented for the purpose by the city of Frankfurt, plans call for its occupancy in late spring of 1953.

NSPFEA Reactivated. The National Spray Painting and Finishing Equipment Association was reactivated and reorganized recently at a series of meetings in the Conrad Hilton Hotel in Chicago.

The initial session was attended by sixteen representatives of leading companies in the industry.

Officers elected were: President, B. Hiley, Black Mfg. Co.; Vice-President, A. F. Sharpe, Sharpe Mfg. Co.; Treasurer, T. L. McCorkle, M & E Mfg. Co. Members of the Executive Committee, in addition to the officers, are: W. Starbuck, Kellogg Division of American Brake Shoe Co., and F. R. Pitt, DeVilbiss Co.

Companies represented at the sessions in addition to the above were: Binks Mfg. Co., Campbell-Hausfeld Co., Decora Mfg. Co., Electric Sprayit Co., and Paasche Mfg. Co.

Beckman Builds New Eastern Plant. Beckman Instruments, Inc., South Pasadena, Calif., manufacturer of scientific and industrial instruments, has started construction of a new building in Mountainside, N. J.

To be used as Eastern sales and service offices for the parent company and as an Eastern manufacturing facility for the Beckman subsidiary, Helipot Corporation, manufacturer of helical potentiometers, the new plant will be of brick, one story high, and will incorporate the latest design features for precision manufacturing. It will be located on a two-acre plot beside the main highway leading to New York. Beckman estimates more than 150 people will be employed in the new plant.

New Plant for Delanium Carbon Corporation. The new factory of Delanium Carbon Corporation at Morton Grove, Ill., is now in production. The facilities of this specially designed plant are being used to produce Delanium graphite cubic heat exchangers. The plant in the future will produce Paragrid absorption and scrubbing towers and other graphite products for the chemical, metallurgical and process industries.

Bersworth Reduces Price of Versene. The Bersworth Chemical Company, Framingham, Mass., have announced that the price of Versene has been reduced by approximately 10 per cent. Versenes are powerful chelating agents widely used in chemical processing throughout industry. The reduction carries over to Versene Fe3 and covers these two products in liquid, powder and bead form.

Detroit Office Established by Aries. The establishment of a Detroit branch office was announced this week by Dr. Robert S. Aries, President of R. S. Aries & Associates, New York, consulting firm of chemical engineers and economists.

The Detroit office will be headed by Mr. R. A. Willinganz, a chemical engineer formerly with the Union Carbide & Carbon Corporation and the Chrysler Corporation.

New Representatives for DeBothezat Fans Division. DeBothezat Fans Division of American Machine and Metals, Inc., announces the appointment of new representatives for the greater New York area and northern New Jersey.

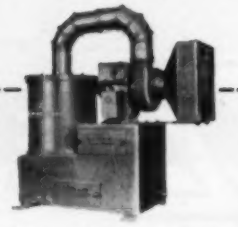
DeBothezat's complete line of industrial ventilating equipment will be handled in those areas by Air, Dust and Fume Control Company, with offices at 50 Church St., New York City, and Broad St., Newark, N. J.

New Plant for Parker Rust Proof Company. A new manufacturing plant to serve East Coast customers has been opened by Parker Rust Proof Company at Mountain View, N. J. Parker products for surface treatment of metals will be made and shipped from the new plant to the metalworking industry throughout the eastern part of the nation.

The new Parker plant brings the benefits of nearby supply to its customers in New England, and the Central Atlantic states. Reductions in freight costs will be gained by many manufacturers; quick delivery (overnight in many cases) will allow smaller inventories to be carried in customers' plants. Parker's Eastern office, formerly in New York City, is now headquartered at Mountain View, also.

Why it pays to SPIN-DRY plated work— small lacquered parts

Choose from 3 carefully engineered models . . .



1. **Standard Model.** Takes nearly every type of part. Built for long, trouble-free service.

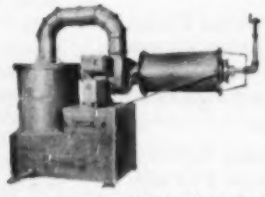
Saves time . . . With the New Holland Kreider Dryer operating at 625 r.p.m. on only ¾ h.p. you can *spin-dry* a basket of parts (1140 cu. ins.) in as little as 35 seconds—no more than 2 minutes.

Improves quality . . . With a New Holland Kreider Dryer, high speed centrifugal spin-drying eliminates scarring and marring, assures smooth evenly dried surfaces, with longer lasting luster . . . fewer "rejects."

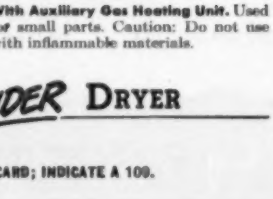
Cuts costs . . . What's more, though a New Holland Kreider Dryer occupies less than 6 sq. ft. of floor space, it's a big money saver. Power costs are low, production high—with little or no maintenance over years. And one man can operate it, easily, efficiently.

See for yourself. Write Department PL153 today for illustrated 4-page folder . . . also addresses of installations near you.

New Holland Machine Co., New Holland, Pa.



2. **With Auxiliary Steam Heating Unit.** Used for small parts that hold moisture—lacquered parts—or where cold water rinse is used.



3. **With Auxiliary Gas Heating Unit.** Used for small parts. Caution: Do not use with inflammable materials.

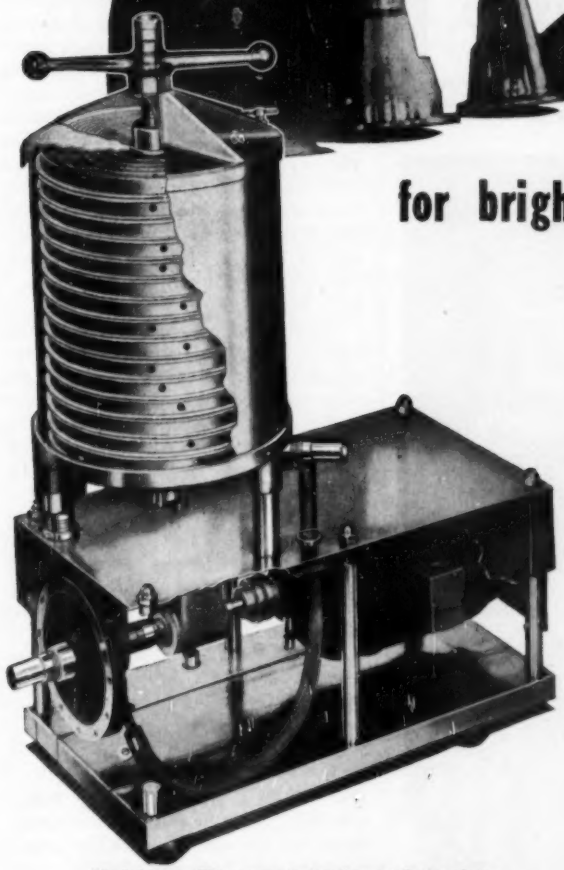
NEW HOLLAND KREIDER DRYER

Proved where performance counts

for brighter, cleaner plating solutions

A long and varied list of cost-minded platers have proved the performance of Alsop "Sealed-Disc" Filters. They're getting better finished plated work—they're saving time and labor and their plating solutions last longer.

The "Sealed-Disc" Filter means positive, trouble-free filtration that's proof against costly rejects and reworking—proof against dirt, dust, sludge and even the invisible impurities that cause nodules and porousness. There's a "Sealed-Disc" Filter to "fit your job"—write for complete information or contact your regular plating supplier.



"Sealed-Disc" Filters were designed especially for plating rooms. They're smaller, compact and more portable than ordinary conventional filters, yet they are capable of handling equal volumes of solutions. "Sealed-Disc" Filters are also performing satisfactory results on many acid dips, electro cleaners, and solvents.

ALSOP
ENGINEERING CORPORATION
801 Fine Street — Milldale, Connecticut

BRIGHTER
Barrel Nickel Plating
with TRUE BRITE
NICKEL BRIGHTENER

Increase Production —
easy to control . . . cuts down on trouble that entails costly delays.

Save time —
can be operated at a higher speed.

Reduce Rejects —
gives unbelievable uniformity of deposit in recesses . . . brighter, whiter color.

Write for **FREE** *bulletin revealing tricks on improving your nickel plating and cutting costs.*

TRUE BRITE CHEMICAL PRODUCTS CO.
P. O. Box 31, Oakville, Conn.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 111.

chromium chemicals bearing
this trademark
are preferred by leaders in the metal finishing industry

MUTUAL CHEMICAL CO. OF AMERICA
SINCE 1845
REG. U. S. PAT. OFF.

CHROMIC ACID
SODIUM BICHROMATE
POTASSIUM BICHROMATE

MUTUAL
CHEMICAL COMPANY OF AMERICA
270 Madison Avenue • New York 16, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 112.

Society News

A. S. M. Establishes Research Foundation

At the annual meeting of the American Society for Metals in Philadelphia the membership of the organization approved the transfer of Society assets totaling $650,000, income from which will be used by the newly established A. S. M. Foundation for Education and Research. Objective of the Foundation will be the advancement and dissemination of scientific knowledge, particularly with respect to the technology of metals, for the use and benefit of the public at large. This goal will be sought either through education and research carried on by the Foundation or through the support of educational and research activities in established organizations and institutions.

National Tool Engineering Research Foundation

The American Society of Tool Engineers has taken initial steps to establish a Research Foundation with plans for carrying out scientific research projects in the fields of manufacturing, manufacturing processes, and allied tool engineering fields. The Society has already appropriated $75,000 as an initial contribution for this purpose. In addition to tentative plans for the use of industrial laboratories, colleges and universities in this country to carry out research projects, an activities directing committee has been appointed.

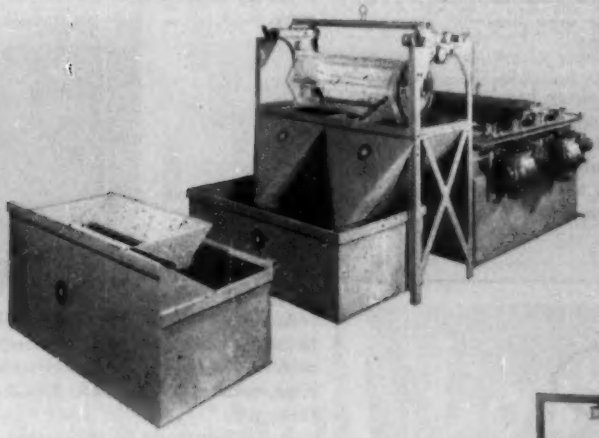
N. A. M. F. Industry Survey

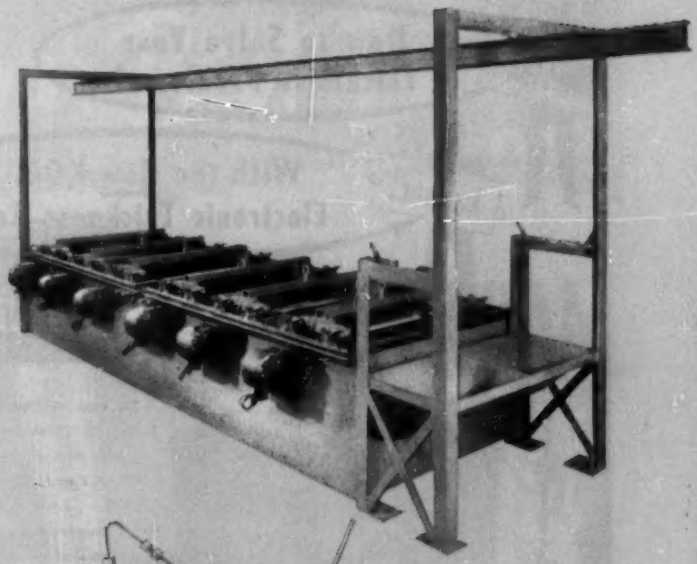
The National Association of Metal Finishers is compiling results of their recent industry survey that was sent to 3,526 companies engaged in plating. Objective of the survey is the continued recognition of the industry as a vital factor to the Nation's economy by the various governmental departments and agencies. All of the industry has been asked to complete a questionnaire as part of the survey in order to make it representative of not less than 90 per cent of the total operating shops. The speedy return of the questionnaire will help in the completion of the survey. Data thus obtained can be used to meet and soften resistance of government agencies to any easement of restrictive orders.

American Standards Association

W. M. Batt, president of SKF Industries, Inc., has been awarded the Coonley Medal for long and distinguished service in the standardization movement. The award is made annually to one who "by his practice and preachments has furthered the national economy through voluntary standardization".

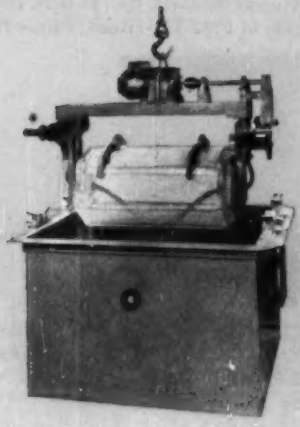
CROWN PLATING BARRELS

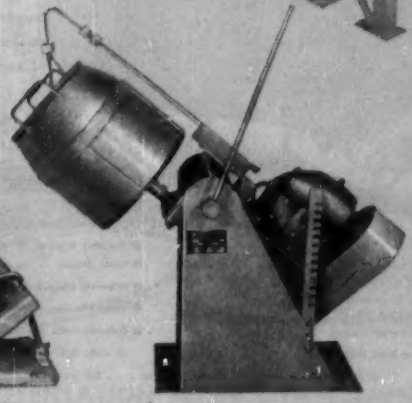




For superior performance there's a Crown Barrel Plating Machine for the job.

A size and type for any barrel plating application.





Write for complete Barrel Machine Catalog

CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

INDICATE A 113.

Personals

Roland H ("Major") Dufault, for the past 20 years manager of the New York district sales office of the duPont Company's Electrochemicals Department, retired on January 1, 1953.

Succeeding him is **Reynolds C. Cochrane,** assistant manager of the New York office since 1949. At the same time **Victor B Sarkissian,** vinyl products sales manager, was transferred to New York as assistant district manager succeeding Mr. Cochrane.

Mr. Dufault began his career with du Pont in 1919 as a salesman for acids and heavy chemicals, becoming manager of the New York district sales office in 1932.

Mr. Cochrane has been in sales work with duPont since 1933. He was sales manager of vinyl products in the Wilmington office prior to his appointment as assistant New York office manager three years ago.

Mr. Sarkissian started as a laboratory analyst at the duPont Niagara Falls, N. Y., electrochemicals plant in 1940, became a technical representative for solvents in the New York sales office in 1942, and was made sales manager for vinyl products in 1952.

Robert F. Hainge has joined the sales staff of Delanium Carbon Corporation. With his headquarters in New York, Mr. Hainge will handle the sale of Delanium graphite cubic heat exchangers, Paragrid absorption towers and other carbon products.

Mr. Hainge was previously associated with Graham Manufacturing Company, Inc., New York City, in heat exchanger and air ejector sales for twelve years.

Taylor Fletcher has been appointed Manager, Special Products Division, Beckman Instruments, Inc., replacing **John F. Bishop,** who was recently made Assistant General Manager of this company.

Fletcher

As design engineer, Fletcher contributed to the development of the Beckman Aquameter, Electronic Analog Simulating Equipment and the Phase Equilibrium Computer.

Fletcher received his B.S. degree in electrical engineering at California Institute of Technology, Pasadena, 1948. He completed graduate work in advanced Meteorology, New York University. He laid the foundation for his present creative engineering work when assigned as design engineer for General Electric, Schenectady, N. Y., and electronic technician with Jet Propulsion Laboratories, Pasadena, Calif.

A. A. Schuenemann has been appointed sales representative for northern Ohio by Wagner Brothers, Inc., Detroit. He will locate at 6502 York Road, Parma Heights,

Schuenemann

Cleveland, to handle Wagner business in Elyria, Toledo, Cleveland, Akron, Canton, Youngstown, Mansfield as well as the greater Cleveland area.

For the past seven years Mr. Schuenemann has been associated with Udylite Corporation as a sales engineer in the same territory and is well known to the plating industry. For ten years prior to that he was with Harshaw Chemical Company, Technical Sales Division. His twenty years' experience in plating also includes engineering assignments with General

Question!
How to Solve Your Thickness Problems?
Answer!
With the New KOCOUR Electronic Thickness Tester!
DETERMINES THE THICKNESS OF METALLIC COATINGS BETTER! . . . FASTER! . . . EASIER! . . . CHEAPER!
The new KOCOUR ELECTRONIC THICKNESS TESTER is the answer to your thickness problems . . . QUICKLY and almost AUTOMATICALLY . . . this highly accurate instrument can determine the thickness of all the commonly plated metals on various base metals . . . thus putting an end to costly rejects and reworking.
KOCOUR'S NEW ELECTRONIC THICKNESS TESTER HAS THESE OUTSTANDING FEATURES:
Set is self-contained.
90-95% accurate depending upon type and thickness of the plate.
Average test requires only about 1 minute.
Minimum thickness determined is 500,000's of an inch (5,000,000 for chromium).
Maximum thickness determined is indefinite.
Operates virtually automatically.
Reads directly . . . no calculations necessary.
Relatively insensitive to surface roughness.
Compactly housed in portable metal cabinet, 17½"x16"x9".
Operates from 105-125 volt, 60 cycle, A.C. electric outlet.
Write today for full information . . . no cost or obligation.
KOCOUR Company
DEPT. PJ
4801 SOUTH ST. LOUIS AVENUE
CHICAGO 32, ILLINOIS
Specify KOCOUR TEST SETS from Your Supplier! Pioneers and Specialists in Testing Equipment Since 1924
P.S. Whether your set-up calls for small or large volume work . . . there's a specialized KOCOUR SET for your requirements . . . developed to do a faster, better, more economical job.

Electric, Cleveland Wire Works Div., and various positions with job plating plants in Cleveland. He received a degree in Electrical Engineering from Ohio State University in 1930 and is a lifetime resident of Cleveland.

R. F. (Ray) Ledford has been appointed director of sales and research, Industrial Filter & Pump Manufacturing Company, Chicago 50, Ill.

Ledford

Mr. Ledford was formerly superintendent of finish, Sunbeam Corporation, and prior to that sales engineer, Hanson-Van Winkle-Munning Company. He is president of the Chicago branch and member of the research committee A. E. S., also a member of the Electrochemical Society and American Society for Testing Materials.

Purdy Miller has been appointed manager of molded goods sales by the United States Rubber Company. Mr. Miller will make his headquarters in Passaic, N. J. He was formerly assistant manager of the Chicago branch and has had many years of experience in sales and branch management.

Jack S. Brundage has joined the New England sales and service staff of the Organic Coatings Division of United

Brundage

Chromium, Incorporated. A member of the New Haven Branch of the A. E. S. he will sell and service the complete line of Unichrome Lacquers, Enamels, and Synthetics.

A lifelong resident of Stamford, Conn., Brundage was an employee of the Zapon Division of the Atlas Powder Company from 1936 until June of 1952. He rose from laboratory assistant to coatings formulator and chemist in 1939. From April, 1941 to March, 1946 he served in the U. S. Army, rising from the rank of private to captain in the Field Artillery. Upon release from the Army, Mr. Brundage returned to Zapon as a sales engineer and held that position until joining United Chromium.

Maury E. Lippert has been appointed General Sales Manager by Sipi Metals Corporation, Chicago, smelters of nonferrous alloys and warehouse distributors of Reynolds aluminum ingot.

Mr. Lippert, with the SIPI organization for the past 14 years, has been active in metal sales for 33 years. He has devoted a considerable portion of his time in the promotion of Brass Ingot and White Metal Sales, as well as the Bearing Metal field.

Franklin F. Roberson and **Arthur J. Medwedeff** have recently been added to the Industrial Sales Department of the Detroit District of Wyandotte Chemicals Corporation. Roberson will headquarter in Detroit; Medwedeff in Flint.

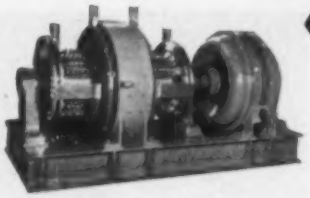
Roberson

Medwedeff

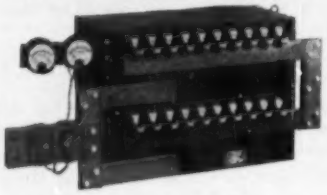
Roberson is a graduate of General Mosors Institute of Technology. His plating, polishing, and buffing experience to-

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 115.

COLUMBIA



MOTOR GENERATORS
for Electroplating, Anodizing,
Electrocleaning, Electropolishing



TANK RHEOSTATS
- REVERSING SWITCHES
- TONG TEST AMMETERS

Protected Territories Available to Qualified Sales Engineers

COLUMBIA ELECTRIC MFG. CO.
4533 HAMILTON AVE. • CLEVELAND 14, OHIO

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 116.

EXTRA HIGH QUALITY 99.7+% PURE

CHROMIC ACID

TECHNICAL GRADE—FLAKE

DEPENDABLY UNIFORM

Our plant is modern; beautifully equipped; operated by men who are proud of the product they make.

FRIENDLY, PERSONAL SERVICE

You can get a quick, unequivocal "Yes" or "No" on your Chromic Acid requirements from interested owner-principals who value your business.

We have yet to have a legitimate complaint on the quality of B.F.C. Chromic Acid. Its chemical analysis is as fine as its physical appearance!

One Price. One Standard of Quality and Service to all—whether the market is short or long. Distributor Stocks in many Principal Cities.

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J.
122 East 7th St., Los Angeles 14, Calif.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 117.

tals 14 years as a Foreman—10 years with Ternstedt Manufacturing Company and one with Ainsworth Manufacturing Company. In addition, he has 6 years of sales-service experience.

Medwedeff holds a Master's degree in Chemical Engineering from the University of Michigan. He has been employed by Buick Motors, AC Spark Plug, and the U. S. Bureau of Mines. He has had considerable experience in the control of electroplating solutions and in analysis of greases and metals.

Herman G. J. Grosser has been appointed Cleveland District sales manager of the Whitfield Chemical Company, De-

Grosser

troit manufacturers of metal cleaning and finishing chemicals for the industrial and ordnance fields. Mr. Grosser was formerly Ohio sales representative.

Bert J. Sherwood has been appointed Technical Representative specializing in Enthone products, by the L. H. Butcher

Sherwood

Company, subsidiary of the Udylite Corporation, Los Angeles. Mr. Sherwood will be responsible for laboratory development and processing in addition to providing assistance in the field to the sales staff on technical problems relating to Enthone finishing processes.

He was employed previously by North American Aviation, Downey, Calif., as supervisory engineer in research and development activities on guided missile and electromechanical component fabrication. He is a graduate of Virginia Tech with a B.S. degree in Chemical Engineering and holds a Master of Science degree in Chemical Engineering from the University of Southern California.

Frank LaMantia has been appointed Chief Purchasing Agent for The Rapid Electric Company. One of his responsi-

In Metal and Alloy Plating

INCREASE OUTPUT! LOWER YOUR COSTS!

with **B&A FLUOBORATE PLATING CHEMICALS**

LEAD
TIN
COPPER
NICKEL
IRON

CADMIUM
INDIUM
ANTIMONY*

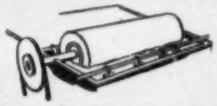
•

FLUOBORIC ACID

*Experimental Quantities Only

For plating airplane and other heavy-duty bearings.

For coating copper and steel wire.



For plating rotogravure cylinders, stereotypes, electrotypes.

For barrel-plating of hardware, housewares.

For plating battery terminals.

For decorative finishes on jewelry, other accessories.

For plating radio and electronic parts.

Important practical advantages B&A Metal Fluoborates offer you:

- ✔ No mixing or dissolving necessary . . . supplied in concentrated solution form
- ✔ Easier bath preparation
- ✔ Stability of bath composition
- ✔ Ease of control
- ✔ Practically 100% anode and cathode efficiencies
- ✔ High conductivity
- ✔ Fine-grained deposits of good color
- ✔ Good covering power
- ✔ Faster, high-speed operation

AND MANY MORE—

In addition to these general operating advantages, each B&A fluoborate bath has a number of special advantages for its particular applications.

For operating data, experimental or commercial quantities—or for free technical consultation—write or phone the nearest B&A office.

BAKER & ADAMSON *Fine Chemicals*

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N. Y.

Offices: Albany* • Atlanta • Baltimore • Birmingham* • Boston* • Bridgeport* • Buffalo* Charlotte* • Chicago* • Cleveland* • Denver* • Detroit* • Houston* • Jacksonville Kalamazoo • Los Angeles* • Minneapolis • New York* • Philadelphia* • Pittsburgh* Portland (Ore.) • Providence* • St. Louis* • San Francisco* • Seattle • Yakima (Wash.)

In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal* • Toronto* • Vancouver*

SETTING THE PACE IN CHEMICAL PURITY SINCE 1882

*Complete stocks are carried here.

REAGENTS

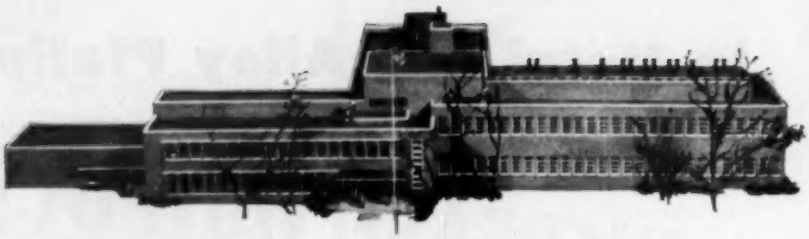
B&A

STANDARD OF PURITY

FINE CHEMICALS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 118.

WYANDOTTE
CHEMICALS

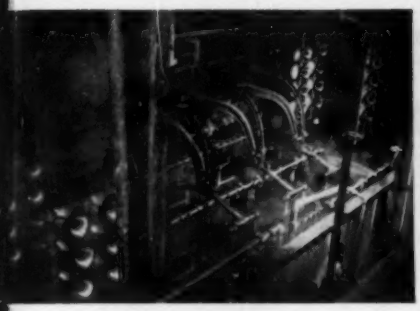


1 *New* WYANDOTTE CHEMICALS research building (above) houses finest facilities in the industry for testing and development of cleaning products and processes for Aviation, Railway and Metal Finishing Industries.

Read these FACTS behind 45% gain in

Test (above) showed that corrosion had just started on PRE-FOS* processed steel after 432 hours of salt spray!

7 ***Spray-booth*** products: Metal Cleaner D, added to water in water-wash booths, coagulates overspray, keeps it from adhering to back wall. Another WYANDOTTE product, Hedral, prevents paint adherence to dry walls. WYANDOTTE Special H strips off paint.



2 ***Fewer rejects***—A parts manufacturer who uses WYANDOTTE F.S.* for electrocleaning of steel parts prior to electroplating, reported fewer rejects due to incomplete cleaning—calls F.S. "thorough and economical to use." You can profit, too, with WYANDOTTE products!

3 ***Wide line*** of cleaners includes W.L.G.,* a product with a balanced formula of exceptional detergency, long life, versatility (cleans copper, brass, bronze as well as ferrous metals). W.L.G. is also used for heavy soak-tank, barrel, and rotary-washer cleaning, low-pressure spray washing.

4 ***Power washing***—WYANDOTTE Metal Cleaner No. 38 puts added power in power washing machines . . . has high detergency, is used for cleaning ferrous and non-ferrous metals. Versatile, economical (through long solution life). Ask your helpful WYANDOTTE service representative to demonstrate.

Wyandotte's amazing cleaning product sales!

Wyandotte Chemicals is the leader—the world's largest manufacturer of specialized cleaning products for business and industry.

And Wyandotte sales climbed 45% in the past 2 years . . . are still going up, UP, UP!

Why? Because more and more industries have learned that *with the leader, Wyandotte, they get advantages they could find nowhere else*: a complete line of high-quality products for every cleaning need; skilled technical service, and research most capable of solving *new* cleaning problems; dependable supply of raw materials from *our own* salt and coal mines and limestone quarries; more than half a century of the broadest possible cleaning experience . . . *all of which can save you money, give you better cleaning!*

May we help you? Write *Wyandotte Chemicals Corporation, Wyandotte, Michigan; also Los Angeles 12, California.*

*REG. U.S. PAT. OFF.

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the United States and Canada

5 ***Railroad cleaning***—Products for every job include free-rinsing, solvent emulsion cleaner, WYANDOTTE-20. One of many WYANDOTTE railroad products, No. 20 does a uniformly fast, thorough job of flushing off heavy grease, oils. The WYANDOTTE line includes vat cleaners, interior and exterior car cleaners, waxes.

6 ***Aircraft***—WYANDOTTE line includes paint strippers (Sprazee), fuel-tank descalants, carbon removers, degreasers; brightening, polishing and corrosion treatments; conveyor power washing, vapor steam cleaning, exterior washing, and electrocleaners; aluminum cleaners and deoxidizers for spot-weld preparation.

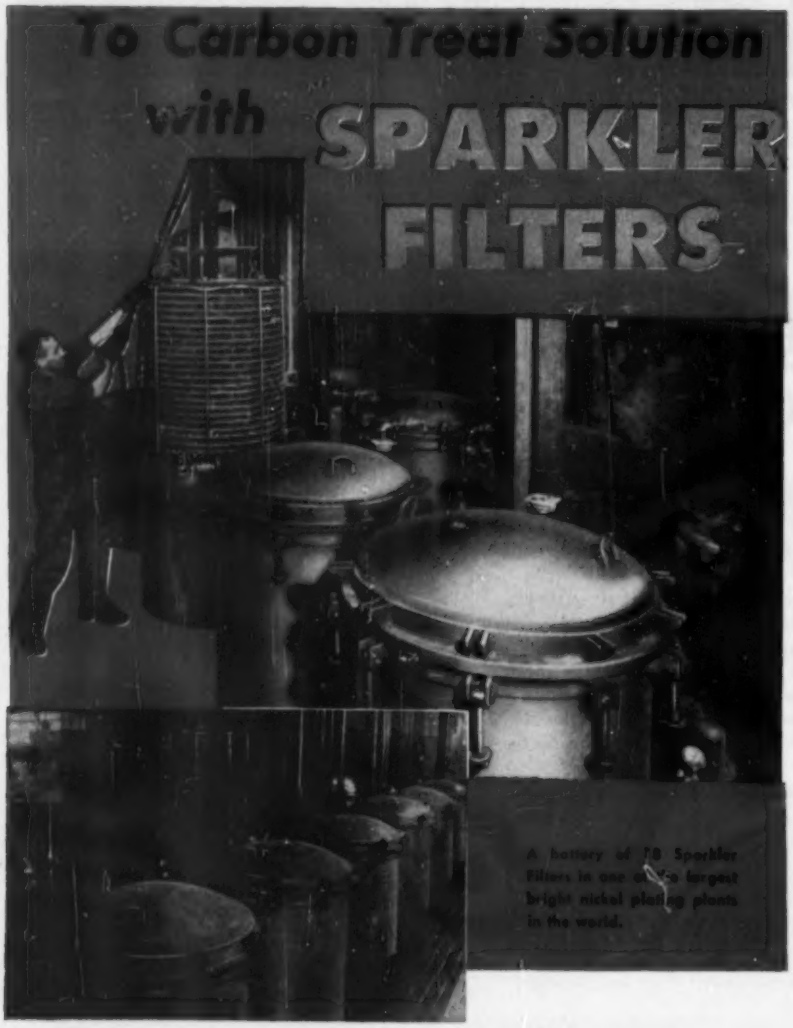
8 ***For steam*** and hot-water pressure cleaning. WYANDOTTE supplies Fairtrex No. 1 for *medium*, and Special H for *heavy* deposits of oil and grease; Altrex*, a mild, noncorrosive product for light oils and grease. Complete line, too, for maintenance cleaning.

9 ***Floor absorbent***—Zorball is a really different product, almost mandatory wherever water, oil, grease, chemicals accumulate on floor. Doesn't break down, blow or track . . . remains skidproof when saturated . . . can be used again after drying. Prevents accidents. Saves dollars.

CLEANING THE WORLD

World's largest manufacturer of specialized cleaning products for business and industry

NO SHUT DOWN



Carbon treatment without shut down is accomplished by cutting out one or two units in a battery of filters, removing the cartridge assembly of filter plates, and replacing with a new plate cartridge dressed with clean filter paper. The proper amount of carbon is mixed with water in a standby tank and recirculated through the filter thus depositing the carbon on the new plates in a cake of uniform thickness and density. The solution requiring a carbon treatment is then circulated through the carbon beds giving the plating solution the carbon treatment without contaminating the tank or stopping plating operations.

The quick change feature of the plate cartridge in Sparkler filters permits replacing a set of plates in a matter of minutes. Production can be resumed without appreciable interruption.

Sparkler Horizontal Plate Filters give absolutely sharp filtration at all stages of the cycle.

SPARKLER MANUFACTURING CO.
Mendota, Illinois

SPARKLER horizontal plate FILTERS

22 FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 120.

Personals

bilities in this position will be the coordination of procurement with production schedules.

LaMantia

Mr. LaMantia has had broad educational training and practical experience in business administration. His previous employment was with the New York Central System, where he served in several responsible capacities over a period of 11 years.

Russel V. Mills has been named Field Engineer in the East Boston, Mass., Territory by The Bellows Company, manu-

Mills

facturers of "Controlled-Air-Power" Devices. Mr. Mills was last employed by the Wolk Company of Waltham, Mass. His new headquarters will be at The Bellows Company, 307 United Building, 43 Leon Street, Boston, Mass.

L. Joseph Moyes has been appointed to the sales staff of the Hanson-Van Winkle-Munn[illegible]mpany, Matawan, N. J.

Moyes

Moyes' headquarters will be in Milwaukee, Wis., and he will service customers in Wisconsin, Minnesota, and upper Michigan. He replaces **E. C. Bosl** who has been transferred to the Company's Chicago office. Moyes' brings with him a broad experience of fifteen years in the metal

It means

Money in your pocket ! ! !

when you Specify Dependable

HYSOL

No. 3401 and No. 3801

COATINGS

for Racks, Tanks and Ducts

at new low prices!

The same high quality Hysol rack, tank and duct coatings—proved in service for over three years—are now available at *New Low Prices*. Increased production efficiency has enabled us to reduce costs and pass savings along to you—from 17% to 22%, depending upon quantity ordered.

Hysol No. 3401 and No. 3801 Coatings

- Protect against chemical attack in plating operations
- Reduce solution drag out losses
- Provide fast coating by your own personnel and equipment
- Reduce current losses by up to ⅓.

Take advantage of these dependable Hysol coatings. Write, phone or wire your order today.

houghton laboratories, inc. OLEAN, NEW YORK

Personals

finishing industry. In recent years his particular interest has been in cleaning and pre-plating cycles from which work he has gained a wide background in all types of buffing, polishing and plating procedures.

Felix W. Saco has been appointed to the position of Mechanical Development Engineer, of the Permutit Company, New York, N. Y.

He attended New York University, receiving a Bachelor's degree in Mechanical Engineering in 1940, and is a member of the American Society Mechanical Engineers and the Technical Association of the Pulp and Paper Industry.

He has been granted several patents for the application of a waste water boiler for internal combustion engines. Some of his past contributions to industry include development of a self-descaling sea-water

Saco

still; design of a control valve for aircraft cabin pressurizing and cooling; design work on a nuclear reactor; mechanical design of air-borne infra-red equipment and the design of a heavy type, high-speed, paper-mill winder.

D. R. Leiser, Vice-President of Harry Holland & Son, has been appointed to represent Whittaker, Clark & Daniels, Inc., in Michigan.

Mr. Leiser is an alumnus of the University of Wisconsin. He served as an ensign and later as a lieutenant in the

Leiser

Navy from 1942 to 1945 in the Pacific war theatre. Following this, he entered the employ of Helfrich Laboratories in Chicago and after two years started with Harry Holland & Son, transferring to the management of their Michigan office in July, 1948.

Harold C. Olson has been named Works Metallurgist for the Los Angeles plant of the Lindberg Steel Treating Com-

Olson

pany. Mr. Olson, who was formerly Works Metallurgist at the Melrose Park, Ill., works of International Harvester Company, majored in metallurgy at the Illinois Institute of Technology and holds a Bachelor of Science degree in civil engineering.

Obituary

✝ **Russell S. Roeller,** General Sales Manager of the Pennsylvania Salt Manufacturing Company, died in the Phoenixville, Pa., hospital on November 12 after a brief illness. He was 60 years old. Mr. Roeller joined Pennsalt as a salesman in 1922, was appointed Pennsalt's Philadelphia District Sales Manager in 1933 and became Field Sales Manager in 1942. He assumed additional administrative duties with his appointment as Assistant General Sales Manager in early 1950 and soon thereafter was named General Sales Manager.

IN EVERY INSTANCE WHERE SEL-REX SILVER SOL-U-SALT WAS INTRODUCED IT WAS ADOPTED AS STANDARD.

SEL-REX SOL-U-SALTS are water soluble in pure crystaline form. Eliminates old-fashioned mixing, calculating or filtering. No objectionable dirt or dust.

SEL-REX BRIGHT GOLD SALTS produces "mirror-bright" deposits in *any* thickness *without* scratch brushing and/or buffing. Uses conventional equipment. Solution is stable and easily maintained.

Write Dept. P-1 for details on complete line of SEL-REX Gold, Silver, Nickel, Copper, Cadmium and Rhodium Salts and Solutions. Ample stocks for immediate delivery.

Sel-Rex SEL-REX PRECIOUS METALS, INC.
229 Main Street • Belleville 9, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 122.

SCHAFFNER

Look at the Record...

and you'll use...

SCHAFFNER

POLISHING BUFFING COMPOUNDS

INQUIRIES INVITED

Tell us in detail of your requirements and we will gladly quote and offer recommendations.

"Schaffner Bros. make things shine"
Bob — Paul — Gus

Schaffner

MANUFACTURING COMPANY, INC.

SCHAFFNER CENTER • ROSEWOOD 1-9902 • EMSWORTH, PITTSBURGH 2, PA.

* TRIPOLI COMPOUNDS * CHROME COLORING ROUGE * GREEN ROUGE * JEWELERS' ROUGE
* CROCUS COMPOUND * STAINLESS STEEL COMPOUNDS * ALUMINUM BUFFING COMPOUNDS
* ALL-PURPOSE BUFFING COMPOUNDS * WHITE COLORING COMPOUNDS * NICKEL BUFFING (LIME) * EMERY CAKE * PLASTIC BUFFING COMPOUNDS * TALLOW GREASE STICK
* PUMICE GREASE STOCK * POLISHING WHEEL CEMENT * STEEL POLISHING COMPOUNDS

COMPOUNDS MADE IN BAR, SPRAY OR PASTE

Trade Literature

L—928. Dynel Work Clothes Catalog—Work clothes made of the new Dynel fabric now are available in an attractive shade of grey which is said to make stains and soil less noticeable, and to make laundering easier, according to bulletin No. 1309-1 issued by Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

Called "MSA ChemKlos", the line of shirts, trousers and coveralls are especially suited to industrial jobs involving use of acids or caustics because the fabric resists corrosive chemicals, as well as wear, moths, mildew, shrinkage, snagging and tearing. For your copy of the bulletin use Reader Service Card.

L—929. Pneumatic Controller—A new catalog now ready for distribution published by Fischer & Porter Company, 6890 Jacksonville Rd., Hatboro, Pa., describes a completely new P-4 Pneumatrol Pneumatic Controller for rate of flow, differential pressure, liquid level, viscosity, pressure, and temperature applications. This controller is usable for either single or dual instrument case mounting and for point-of-measurement installation as well. This catalog describes in detail the action and components of this controller. Copies of catalog C-50 may be obtained by using Reader Service Card.

L—930. Oxygen and Nitrogen Generators—Air Products, Inc., P. O. Box 538, Allentown, Pa., have released a new 12-page catalog which details information on oxygen-nitrogen generators and equipment for all other low temperature processes. For your copy of catalog No. 52 use Reader Service Card.

L—931. The ABC of VCI—Two new illustrated bulletins on Volatile Corrosion Inhibitors, a modern method of protecting ferrous metals and aluminum from rust and corrosion without using oil, grease, or goo, are offered by the Berlin and Jones Company, Inc., 601 W. 26th St., New York 1, N. Y.

Technical Bulletin VT-1 was written to serve as a general primer, or ABC of VCI and "VPI" corrosion inhibitors. Among the many subjects covered are improper applications; "bugs" to guard against; VCI as a control for finger print corrosion; toxicity; galvanic action; reactions with non-ferrous metals and non-metals; effects of moisture and condensation; shelf life and package life; plus other basic data.

General Bulletin GB-1 deals specifically with "DryVapor Pack-velopes, a positive protection for Steel and Aluminum". Cost saving and time saving advantages obtained from using these industrial engineered envelopes are enumerated and explained. For your copies of these bulletins use Reader Service Card.

L—932. Automatic Voltage Stabilizer Bulletin—A new 12-page, two-color bulletin on automatic voltage stabilizers ranging from 15 to 5,000 volt amperes has been announced as available from the General Electric Company, Schenectady 5, N. Y.

The booklet contains photographs and diagrams of the equipment, explains operation principles and construction, and gives complete specifications. It also describes the causes and effects of voltage variations and lists typical applications for stabilizers. For your copy use Reader Service Card.

L—933. Notes on Nickel Plating from a Fluoborate Bath—A 6-page reprint by the International Nickel Company, Inc., New York, N. Y., including tables and references. Describes a tough ductile and relatively low stress deposit from a fluoborate bath, whose high buffering capacity and good conductivity make it attractive for rapid plating of heavy deposits. An easily controlled process that produces good adhesion of nickel to steel and copper surfaces. For your copy use Reader Service Card.

L—934. Industrial Washers Booklet—An 8-page, 3-color booklet, which describes in detail their complete line of industrial washers, is offered by the Detrex Corporation, Box 501, Detroit 32, Mich. The booklet is profusely illustrated with actual photographs of equipment ranging from single-stage, totally enclosed cabinet

HE HAS THE "KNOW-HOW" TO SERVE THIS "WHO'S WHO"—

Monroe Auto Equipment Co.
General Motors Corp.
Oldsmobile Division
Pontiac Motor Division
Buick Motor Division
A. C. Spark Plug Division
Saginaw Steering Gear Div.
Kirsh Co.
Kelsey Hayes Wheel Co.
Ford Motor Co.
Electric Auto Lite

ARTHUR SOMERS
Michigan and
Northern Ohio Representative
of N. Ransohoff, Inc.

At your service if you are located in his territory.

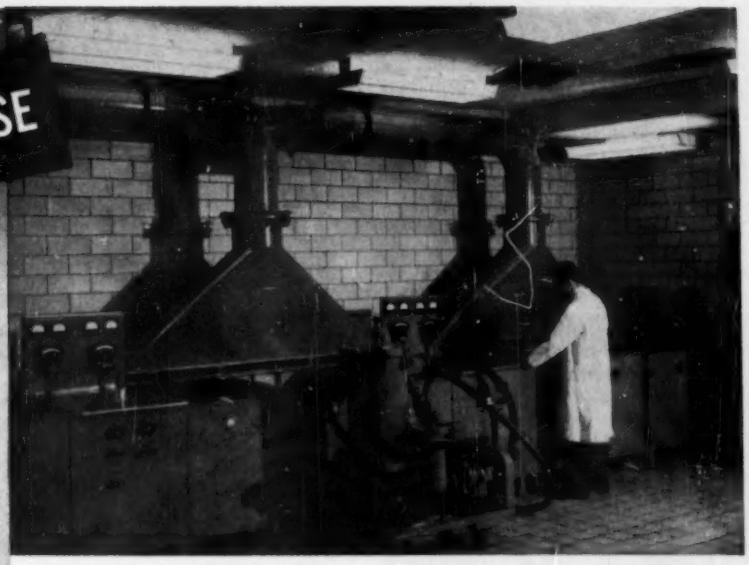
Art Somers well typifies the creative, practical inventiveness of Ransohoff metal-cleaning experts. His conscientious analysis and helpful recommendations to important industries, characterize Ransohoff service to *all* users of their made-for-the-job metal cleaning and surface treatment equipment. Art Somers contributes to and shares in the over 175 years of engineering experience represented among field and headquarters staffs.

N. RANSOHOFF, inc.
EQUIPMENT FOR THE SURFACE TREATMENT OF METAL
5817 VINE ST. CINCINNATI, 16, OHIO

WESTINGHOUSE

Our illustration shows a corner of the extensive pilot plating plant at Westinghouse's East Pittsburgh laboratories, where many improved plating processes have been developed and tested.

For example, this line of 100 gallon tanks was used to perfect the company's P.R.* process of plating to secure brighter finishes by periodic reversal of the plating current.

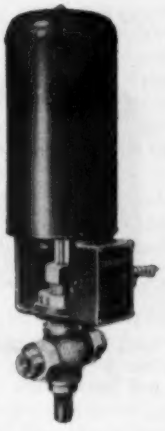


Five Sarco Type LSI indicating electric controls actuating solenoid valves to maintain any desired constant plating temperature on 100 gallon tanks of PR process pilot line at East Pittsburgh.

SARCO PLATING CONTROLS

Sarco Plating Controls were selected as a result of several years' experience in Westinghouse plants in Pittsburgh and elsewhere.

You can buy them with confidence. Low first cost, high accuracy, long life with minimum maintenance cost are outstanding features. Write for our Bulletins and the name of the Sarco man nearest you. His experience may include the solution to some of your control problems.



Sarco Type LSI indicating electric temperature control for all kinds of plating. Long or short temperature ranges custom made as needed. Bulletin 1026.

*For full information on this process see the article in the May 1st, 1950, issue of "Steel".

New: Sarcostat hydro-electric motor valve for use with LSI thermostats in place of solenoid valves. Powerful, direct thrust—no pilots or levers, slow opening and closing. Bulletin 1081.

SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 8, ONTARIO

Trade Literature

washers to huge, five-stage phosphate coating and paint bonding machines. The operational advantages of "one-source efficiency" are described in the Detrex washer booklet. Also included are some general washer operating hints that will be of valuable assistance to plants using alkali or emulsion washers in their production cleaning line.

L—935. Adhesive, Coating, Sealer Booklet—Up-to-date uses for "3M" adhesives, coatings and sealers in industry, are shown in a new booklet announced by Minnesota Mining and Manufacturing Company's Adhesives and Coatings division in Detroit.

The 8-page booklet describes and pictures 25 various industry-wide uses for the material. It shows, for example, adhesives for holding plywood to metal, rubber to metal, and vinyl to wood; coatings for anti-corrosion protection, smoothness and safety; and sealers for fuel tanks, auto windshields, and aircraft canopies.

In addition, the booklet describes and lists complete technical information on 26 of the firm's chief adhesive, coating and sealer products. For your copy of this informative booklet use Reader Service Card.

L—936. Automatic Control System—Atmospheric condensation, affecting damageable items in storage, can now be avoided by an automatic control system, engineered by The Foxboro Company, Foxboro, Mass. As described in newly issued Data Sheet 000-8, the system keeps the temperature of the stored material above the dew point (moisture formation point) of the air. Since the controller takes this corrective action before moisture conditions develop, it completely eliminates a major cause of expensive storage losses. For additional data use Reader Service Card.

L—937. Heat Resistant Gloves—All-leather heat-resistant gloves, said to be able to "take" temperatures up to 800° F, are described and pictured in a new bulletin offered by the distributor, Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

The gloves are said to be pliable, durable, comfortable and economical, and are the development of nearly 10 years of research. Full details are contained in the bulletin, available through use of Reader Service Card.

L—938. Flexible Tubing Catalog—A complete line of flexible tubing, in diameters from less than 1 to 30 inches, is described in a new 4-page bulletin available from Flexible Tubing Corporation, Guilford, Conn. The ducting, made of fabric supported rubber or plastic wound on helical spring wire coils, is lightweight, highly retractable, non-collapsable, non-kinkable, flexible enough to allow up to 180° turns, and requires no installation skill. For your copy of catalog C2-3 use Reader Service Card.

L—939. Wagner Price-Tips—A new, interesting and informative 6-page bulletin is being issued monthly by Wagner Brothers, Inc., Detroit, Mich. The bulletin, "Wagner Price-Tips", contains price information on all plating and polishing supplies and standard equipment distributed by Wagner Brothers, and news of recent developments in the plating industry. The data is timely and of interest to all plating men. Copies may be obtained by using Reader Service Card.

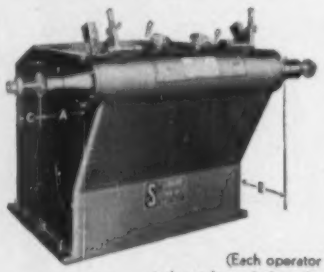
L—940. American Selenium Rectifiers—American Rectifier Corporation, 103 Walker St., New York 13, N. Y., have issued Bulletin No. 271 which details answers to important questions on the use, availability, life, operation, etc., of rectifiers. For your copy of this informative data bulletin use Reader Service Card.

L—941. Factors Influencing Industrial Plant Location—To aid company management and engineers in the selection of the one location for a new plant that will offer the best combination of factors affecting total production cost, Walter Kidde Constructors, Inc., engineers and builders, has published a brochure entitled "Factors Influencing Industrial Plant Location".

The 12 page, 8½ x 11 inch publication is a compilation of 64 basic questions which management must answer and evaluate in order to select the best site for a new plant. For your copy of this booklet use Reader Service Card.

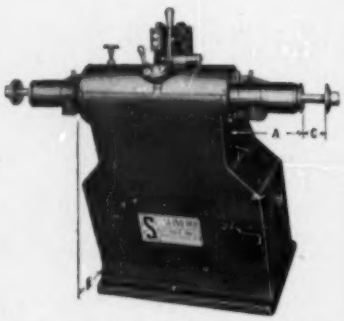
For BUFFING & POLISHING

HERE'S PEAK EFFICIENCY THAT SAVES YOU TIME AND MONEY.
These machines with their "Speedial" controls give you any spindle speed from 1500 to 3000 R.P.M., Instantly! Other speeds from a minimum of 300 R.P.M. to 5000 R.P.M.



(Each operator is independent of the other.)

Type R2V. Independent Spindles Two 3 H.P., Two 5 H.P., Two 7½ H.P., and Two 10 H.P.



Type RV. 3, 5, and 7½ H.P., and 10 H.P.

Type 1BVP: 1—3 H.P. Available in Bench or Pedestal Model in 2 and 4 Ball Bearing Construction.

30 MODELS FROM 1 H.P. TO 20 H.P.

- Maintains peripheral speed throughout wheel life.
- Gives you maximum usable wheel life.
- Lower production costs.
- Higher production.
- Also available in single or multiple speeds from ½ to 60 H.P.

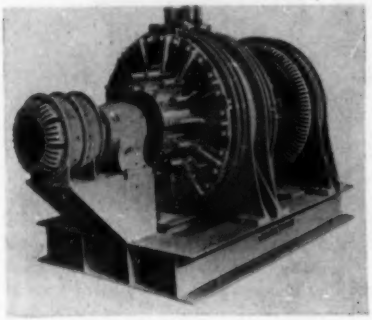
See us at Booth 660, Western Metal Congress, March 23-27, Los Angeles

WRITE FOR CATALOG 44 TODAY

the STANDARD electrical tool co.
2525 River Road • Cincinnati 4, Ohio

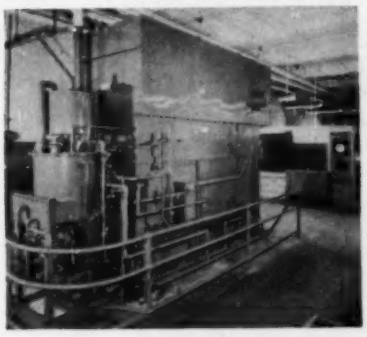
Equipment and Supplies

E—113. Motor Generator Line Re-designed—The Chandeysson Electric Company announces a complete re-design of its line of equipment. The new line features improved commutation, all-welded



steel construction, increased accessibility and higher overall efficiency. Generator and exciter brushes, coils and commutator are now fully accessible for inspection, cleaning or removal without the necessity of removing any other components. High pull-out torque permits smooth efficient operation even when the generator is overloaded. The new line of generators is available in sizes from 300 to 20,000 amperes at specified voltages. For further information use Reader Service Card.

E—114. Instrument Parts Degreased Under Automatic Control—A new Blakeslee Solvent Degreaser, equipped with automatic control instrumentation, has speeded instrument production at

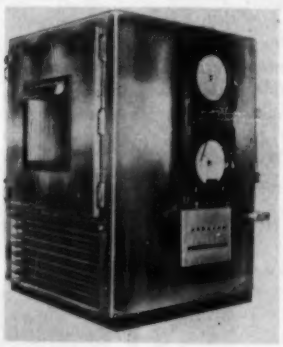


The Foxboro Company, Foxboro, Mass., where thousands of parts for industrial indicators, recorders and controllers are processed daily. The control system insures thorough removal of cutting oil and metal particles. Departmental operating costs are lowered and health hazards reduced by minimizing the loss of vaporized solvent. For additional information use Reader Service Card.

E—115. Hanging Hull Cell—The Rohco Hanging Hull Cell is a simple device for making plating tests of your bath under production conditions. It is simply suspended on the cathode busbar, and daily spot checks are made with almost no time or effort. Minor bath corrections can be made immediately. Adaptable to any type of still or automatic plating, the Hanging Hull Cell is invaluable in following trouble through a sequence of operations. For additional information use Reader Service Card.

E—116. Brush Alodine Folder—A new edition of the Brush "Alodine" folder has been released by the American Chemical Paint Company, Ambler, Pa. The folder in its revised form will interest many readers who process aluminum. Copies are available through use of Reader Service Card.

E—117. Temperature Humidity Test Chambers—To supply industry with a standard line of environmental test chambers for conducting temperature-humidity tests, Tenney Engineering, Inc., 26 Avenue

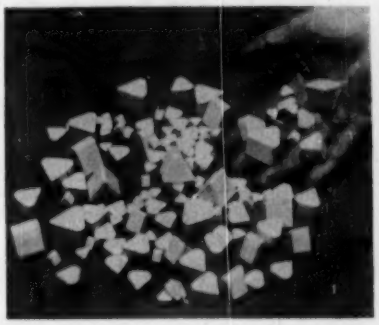


B, Newark 5. N. J., has standardized on five basic chamber types which permit purchasers to select chambers from existing specifications and eliminates the extra cost of custom built models. These chambers automatically maintain humidity from 20 to 95 per cent through a temperature range of 35° F to 185° F. Minimum dew point is 33° F. For additional information on the Tenney TH chambers use Reader Service Card.

E—118. Wire Cup Brush—A new wire cup brush with replaceable filler has been developed by Hewitt-Robins, Inc., 666 Glenbrook Rd., Stamford, Conn., for the removal of rust, scale, paint and welding slag from railroad equipment, tanks, gears and other metal surfaces.

The new brush consisting of inner and outer metal adapters with a replaceable filler, is expected to be more economical because the metal adapters need be purchased only once. The cup shaped filler can be replaced a limitless number of times. The brush also features improved balance, shock absorption and bristle retention. It will be available in wire gauges ranging from .014 inch to .028 inch. For further information use Reader Service Card.

E—119. New Tumbling Media—Crown Pebs, a newly developed tumbling media for barrel tumbling, deburring and finishing have been introduced by Crown Rheostat & Supply Company, Chicago. They are being used in a wide variety of deburring and tumbling operations. Pebs, made



of tough white ceramic, are of uniform size and triangular shape. They are available in a variety of sizes. The manufacturer states that the tough wear resistant ceramic used in the making of Pebs insures a service life several times longer than either natural stones or aluminum oxide type of tumbling chips. Because of their uniform size and shape they can be quickly and easily screened to separate one size from another, and from the work being processed. For more information on this material use Reader Service Card.

E—120. Midget Packing Gland—A new midget packing gland designated as Model MPG has just been announced by the Conax Corporation, 4515 Main St., Buffalo 21, N. Y.

This new Conax Midget Packing Gland is designed as a standard seal for entry of small dial-type thermometers, thermocouple wells, pitot tubes, static pressure probes, round rods or tubes or even insulated electric lines. These many adaptabilities provide maximum utility and ease of installation in production and process control, pilot plant, laboratory and experimental applications involving pressure systems of gases, vapors and liquids in closed vessels under positive and negative pressures.

This packing gland is machined entirely from Type 303 Stainless Steel cold drawn bar stock for maximum corrosion resistance, trouble-free operation and interchangeability from one process to another. For complete information use Reader Service Card.

E—121. Regulated Reversible RF DC Power Supply—Neutronic Associates of 83-56 Vietor Ave., Elmhurst 73, N. Y.,

announce the availability of their Model No. 33HRR, 1 KV to 30 KV, regulated, reversible, 5 milliampere rating, RF DC Power Supply. This equipment has been developed to provide a tool for serious research beyond the usual current limitations of RF high voltage power supplies. For additional information use Reader Service Card.

E—122. Wet Blasting Machine—The addition of a new model to its line of wet blasting machines is announced by American Wheelabrator & Equipment Corporation, 1180 S. Byrkit St., Mishawaka, Ind.

Known as the Model 64 Liquamatte, it is intended for all precision cleaning and finishing applications involving large and heavy pieces. This machine, sized 6 ft in length by 6 ft 10½ inches in depth by 8 ft 11 inches in height, will handle single pieces or loads of pieces up to 3500 lbs in weight. It has two 49 inch x 36 inch counter-balanced doors and has a 6 ft long accessory tank to receive the parts from the blast chamber for rinsing. For additional information on this equipment use Reader Service Card.

E—123. Pilot Air Valves—A new line of pilot air valves has been announced by Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass. Known as the Series 3000, they are used for remote control of pilot pressure operated 4-way air valves. These new pilot valves can also be substituted for direct control valves in such installations where a ¼ inch 3-way air valve is indicated.

Six types of operation are available. The palm button, push button, and cam are offered in both side and foot mountings. The foot and solenoid types are offered only in foot mountings. For additional data use Reader Service Card.

E—124. Compact, Mono-Column Demineralizer—The Penfield Manufacturing Company of 19 High School Ave., Meriden, Conn., has announced a new mono-column demineralizer with a capacity of 4500 grains designed for users of up to 100 GPH of super high purity water.

The new Penfield M-100 Demineralizer is exceptionally compact, requiring for its installation only 2 ft x 2 ft x 7 ft 6 inch of floor space, connection of influent to a plant's water system, and connection of effluent to those points where high purity water is required.

Regeneration of the resins when needed is accomplished in a single operation consuming under an hour of time by means of a simple system that is an integral part of the demineralizing unit.

Complete information on Penfield's demineralizing equipment may be secured by using Reader Service Card.

E—125. Blower Type Electric Unit Heater—The Chromalox UB series of blower-type electric unit heaters now includes a large 20 KW model according to

an announcement by Edwin L. Wiegand Company, 7686 Thomas Blvd., Pittsburgh 8, Pa. The new heater, like older 2 to 17 KW models, is suitable for floor, wall or ceiling mounting.

The UB heater consists of a heavy-gage, sheet metal case with durable, brown wrinkle finish, one or more Chromalox Koilfin strip elements sheathed with steel for safety, and a fractional horsepower motor blower. Adjustable aluminum lou-

THE NEW DANIELS 8H

Daniels presents the radically new 8H Plating Barrel with these innovations:

- New Cylinder Arm and Arm-lock
- New Materials and Modern Design
- New rubber-covered Contact Frame
- Three Cylinders to choose from — Bakelite, Rubber or high-temperature Lucite

Designed to fill the demand for a small barrel for efficient plating of small lots of bulk parts, the 8H is ideally suited for precious metal plating, laboratory work and as a supplement to the production plating plant.

DANIELS PLATING BARREL & SUPPLY CO.

MANUFACTURERS & DISTRIBUTORS
Electroplating and Polishing Equipment and Supplies

129 Oliver Street, Newark 5, N. J.
MArket 3-7450

Be sure to write today for our new illustrated catalogue.

DANIELS

rounding out 75 busy years---

in peace---

and in the needs of national defense!

The year 1953 marks the 75th anniversary of The Seymour Manufacturing Co. — an industry founded in the reconstruction years following the Civil War but slated for ever-increasing activity in both peace and war.

From a few hundred feet of floor space, and meagre equipment and personnel capable of producing a few thousand pounds of nonferrous alloys in a day, The Seymour Manufacturing Co. has grown to international scope, with several factories, 400,000 feet of floor space and over 800 employees.

While the products of an earlier day went into the limited utilities of that time, those of Seymour today cover a wide bracket of use: In radio and TV equipment, scientific instruments, flatware and zipper metal, electrical devices and appliances, and discs for shell casings, atomic energy and many other war items.

Seymour basic products include:

NICKEL SILVER — an alloy of copper, nickel and zinc, silvery white in color, highly ductile, tough and corrosion-resistant.

PHOSPHOR BRONZE — an alloy of copper, tin and phosphorus. Qualities: high fatigue resistance and corrosion resistance; a "must" in many electrical products.

NICKEL ANODES, in all shapes and formulas for modern plating. Also, Anodes of copper, brass and other underplate alloys.

BRIGHT NICKEL, a hot, organic bath, the use of which eliminates the need for coloring and buffing. Glad to send complete information on any product.

SEYMOUR

THE SEYMOUR MANUFACTURING COMPANY

SEYMOUR, CONN.

Nickel Silver • Phosphor Bronze • Nickel Anodes

NONFERROUS ALLOYS SINCE 1878

vers can be tilted to deflect the warm air stream up or down about 20 degrees. A thermal cutout guards against overheating. For more information about Chromalox unit heaters use Reader Service Card.

E—126. Corrosion-Resistant Tank Liners—Corrosion-resistant tank liners made of Agilene (polyethylene) and Agilide (unplasticized polyvinyl chloride) are now offered by the American Agile Corporation, P. O. Box 168, Bedford, Ohio.

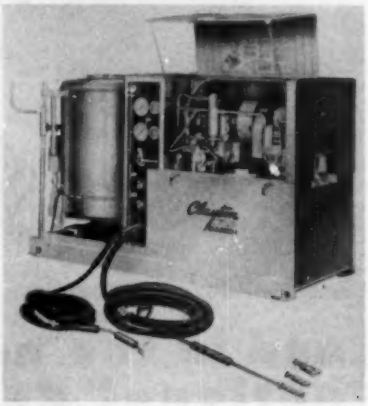
These tank liners, which are of fully welded construction, are made to customer's specifications and can be furnished complete with drain and overflows.

The chemical inertness of Agilene or Agilide and the welding method employed in the fabrications of such tank liners guarantees a leak-proof liner and reduces maintenance and replacement costs of storage, make-up, and plating tanks containing corrosive liquids. For additional data use Reader Service Card.

E—127. "Pressure-Cooled" Buffs—Now for the first time, a "Pressure-Cooled" buff is available in sizes as low as 8 inch diameter. Made primarily for use in the silver and cutlery field on Clair, Porter-McLeod, Nicholas and similar equipment, the units are suitable for hand operations as well.

The "300" series "Pressure-Cooled" buffs are offered as a companion line to the "500" and "700" series which have proven their value in the electroplating industry. They are available in a variety of cloths and densities and feature a unit-type metal-center assembly. For further information use Reader Service Card.

E—128. Steam Cleaning Machine—Designed originally for use at Armed Services bases around the world, and now made available in a civilian model for the first time, development of the extra heavy-duty and high capacity BOE-600S Clayton Kerrick Steam Cleaner is announced by the Clayton Manufacturing Company, El Monte, Calif.



The new machine, capable of discharging up to 540 gallons per hour of pressure detergent spray and up to 540 gallons per hour of hot or cold pressure rinse simultaneously, offers virtually double the cleaning capacity of standard steam cleaning equipment. The BOE-600S is designed to solve the cleaning problem in any operation requiring large scale cleaning on a mass-production scale. Illustrated literature, presenting detailed specifications, is available. Use Reader Service Card.

E—129. Portable pH Meter—Photovolt Corporation, 95 Madison Ave., New York 16, N. Y., announce a low-priced battery-operated *p*H meter of utmost simplicity. The model 125 meter works with only 3 ordinary radio batteries which give 2000 hours of service. This has been achieved by the use of advanced designs of subminiature tubes and circuits which also make possible a drastic reduction of the number of electronic components. As a result, the instrument can be offered at a low price and yet a high accuracy of 0.03 *p*H is insured. While the meter is primarily intended for battery operation, a stabilized power supply unit can be furnished to operate the instrument from the a.c. power line without the use of batteries. For additional information use Reader Service Card.

E—130. Cleaner for Radio-Active Decontamination—Out of an urgent need noted by industrial engineers and scientists for an easy-to-use cleaner which could work effectively as a surface radio-active decontaminating agent has come a

. . . . 4 WAYS NANKERVIS
***Automatic* COMPOUND APPLICATORS**
Cut Down Buffing Costs . . .

1. SAVE ON LABOR

Nankervis compound applicators feature complete *automatic* operation on either single or multiple-head applications. Costly wheel tender's time is eliminated.

2. SAVE ON BUFFS

Automatic application means that just exactly the right amount of compound is applied—no burning from too little compound, no glazing from too much. Result: no quick wear from excessive raking.

3. SAVE ON COMPOUND

Efficient, "just-right" application means no waste. Automatic application of bar compound is cleaner, too!

4. CUT DOWN REJECTS

Uniform application of compound minimizes buffing rejects.

Yes, it's true!

Nankervis automatic compound applicators can save you plenty—up to 40% of your buffing costs. Easily installed on any jack stand, semi- or fully-automatic buffing machine. Write today for Bulletin P-12.

GEORGE L. NANKERVIS COMPANY
Metal Finishing Equipment
19255 W. DAVISON AVENUE DETROIT 23, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 129.

new cleaner, specifically created for that purpose, and yet having properties giving it many other cleaning uses. This remarkable compound has been named simply, "CP Cleaner" by Enley Products, Inc., 254 Pearl St., New York City. Thorough tests have proved its effectiveness in washing away radioactive surface contamination.

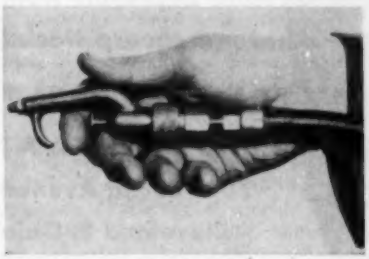
Because of "CP Cleaner's" remarkable cleansing properties it is of importance for industrial and laboratory use. For further data use Reader Service Card.

E—131. Electrolytic Alkaline Descaling Process—Enthone, Inc., 442 Elm St., New Haven, Conn., has announced that their alkaline electrolytic process for derusting of metals will accomplish effective and complete scale removal of metals by the use of periodic reverse current. Cathodic treatment of rusted steel and alloy steel parts accomplishes rapid rust removal without any attack upon the base metal. This makes the process ideal for removal of rust where no etching can be tolerated on the base metal, such as highly finished tools, rolls, ball bearings and high carbon steel parts. Further information can be secured in a technical bulletin by using Reader Service Card.

E—132. Thin Gauge High-Nickel Alloy Strip—High-nickel alloys, rolled to precision-tolerances and ultra-thin gauges, for use throughout industry, are now available from the Industrial Division, American Silver Company, Inc., 36-07 Prince St., Flushing 54, N. Y.

These metals (which include temperature compensation, low expansion, high permeability, glass sealing, and electrical resistor alloys), are now rolled to specifications by this company in strip up to 8 inches wide and down to .0005 inch—to tolerances as close as ± .0001 inch. The strip is available in any quantity from one pound to thousands of pounds. For additional data use Reader Service Card.

E—133. Two Stage Blast Air Blow Gun—Supreme Machined Products Company, Spring Lake, Mich., are now manu-



facturing TU-FLO, an ingeniously engineered air blow gun, which is free of all of the normal problems and trouble spots usually encountered with the average air blow gun.

The positive two stage throttling action was developed to get away from the danger and discomfort of having a cloud of dust, dirt, grit, blown in the operator's face. For 9/10ths of the control button travel only a small volume of air is permitted. For a full blast, the button is pushed all the way. For additional data use Reader Service Card.

E—134. Neoprene Cold Bond System—A means of bonding cured Neoprene sheet to metal, wood, and concrete, normally achieving values exceeding those obtained by vulcanizing under heat and pressure is announced by Gates Engineering Company, P. O. Box 1711, Wilmington, Del. The Gaco system is not to be compared to the use of cold adhesives and cements. The Neoprene bonding agent actually cures rapidly at room temperature and the entire covering becomes a homogeneous mass of Neoprene. For full details use Reader Service Card.

E—135. New Developments in Protective Coatings—Two major changes have been announced in the protective coatings field by the Flexrock Company, 3605 Filbert St., Philadelphia 4, Pa.

The first is the use of vinyl resin formulated with acrylics and the other is the use of rubber resins formulated with acrylics.

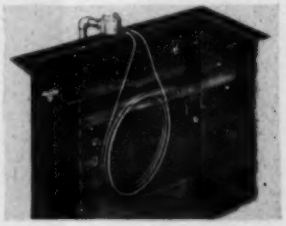
The manufacturer states these new coatings have greater chemical resistance and greater adhesion to metal, wood, and concrete surfaces. A new division has been formed by this company which will be headed by Mr. John G. Wild, a specialist in the field of protective coatings for 15 years. For additional information use Reader Service Card.

E—136. Acid Carboy Dumper—A carboy dumper, for use with hoists or overhead conveyors, that permits quick, safe handling of acids is offered by General Scientific Equipment Company, Philadelphia 32, Pa. The G-S Speedo Safety Carboy Dumper No. 77 can be quickly attached to any overhead hoist for dumping, moving, storing, loading, filling and general handling of acid carboys. For complete information use Reader Service Card.

E—137. Wet Blasting Prolongs Tool Life—The Cro-Plate Company, Inc., Hartford 5, Conn., announces that wet blasting has been used successfully to lengthen cutting tool life. In some cases more effective than hard chrome and much less expensive, taps, reamers, broaches, twist drills, gear holes, milling cutters, cut-off saws, etc., have lasted up to 8½ times as long following Pressure Blasting with a fine, 5000 grit size abrasive.

Similar in effect to hand honing, Pressure Blasting removes feather edges and blends directional sharpening lines. Microscopic etching of the tool surface also occurs which creates thousands of tiny oil wells for better lubrication retention. The blending of the directional grinding lines insures smooth, even chip-flow and eliminates the possibility of the heat factor to "weld" chips into deep reliefs. For additional data use Reader Service Card.

E—138. Immersion-Type Electric Heater—Design of a new immersion-type electric heating unit for electroplating baths has been announced by Edwin L. Wiegand Company, 7686 Thomas Blvd.,



Pittsburgh 8, Pa. The CTL heater has a thick lead sheath which resists corrosive acid action of copper, chrome, and nickel solutions.

The new unit offers many advantages over steam heating: There is no installation cost—the heater is simply hung over the side of the tank. Being portable, several plating tanks can be served by one heater. For more information about the CTL heater use Reader Service Card.

E—139. Non-Slip Work Gloves—New non-slip, long wearing work gloves that grab and hold on slippery surfaces are coated with vinylite resins. Adding inert particles to the durable coating of vinylite resins produces a rough surface with high gripping power. Resistant to acids, alkalies as well as oils, greases, lubricants and most chemicals, vinylite resins form tough coatings with high abrasion resistance that remain flexible at low temperatures. Fully coated or only palm coated and with wing thumbs, these new work gloves are available in all styles including gauntlet and knit-wrist, and are produced by Plasticote Glove Company, Milwaukee 12, Wis. For more information use Reader Service Card.

E—140. Hammer Finish Enamel—Development of a new type of Hammer finish enamel which has qualities previously unattained, including utmost ease of application and complete uniformity of pattern, is announced by The Monroe Sander Corporation of Long Island City, manufacturers of industrial finishes.

This new product, known as Sanco Hammer Finish, results from the development of new synthetic resins and eliminates many problems once faced by manufacturers of metal products.

The new finish is available in a wide variety of colors, bakes rapidly to an unexcelled adhesion, is chip and scratch resistant, and because it covers imperfections with one coat, it does not require

Cowles

HS

for longer life cleaning

HS is an anhydrous, silicated, heavy-duty soak and barrel cleaner of medium alkalinity. It is formulated to give maximum cleaner life with extraordinarily heavy soil loads. HS contains no soaps . . . is free rinsing and produces no undesirable scums on acid and rinse tank solutions. HS allows separation of the oil and removal of such oil from the detergent environment when an overflow principle is used. HS is particularly recommended wherever production specifications demand large amounts of oil removed from in-process parts. Write for complete information.

COWLES TECHNICAL SERVICE gladly furnished upon request

Prompt shipments from convenient warehouse stocks.

COWLES CHEMICAL COMPANY

METAL CLEANER DEPARTMENT

7016 Euclid Avenue

Cleveland 3, Ohio

any primers. For additional information use Reader Service Card.

E—141. Motor Driven Acid Pump—A new acid pump has been designed by General Scientific Equipment Company, 2700 W. Huntingdon St., Philadelphia 32, Pa., for those requiring a faster flow of acid and other liquids, and for those who in some cases must elevate the flow to a height of 12 feet.

The pump is self contained, portable, compressor and electric motor driven, fully equipped with safety air valves which prevents the pressure from exceeding 15 lbs.

As regularly supplied the pump will fit all standard carboys, but special plugs and adapters are required to fit some stainless steel, aluminum, and plastic containers. For complete information use Reader Service Card.

E—142. New Domestic Production of Copper Cyanide—The likelihood of any more acute shortages of copper cyanide such as recently faced the Finishing Industry should be greatly diminished in the future, according to an announcement by the Kaynide Division of Kraft Chemical Company, Inc., Chicago. The announcement states that shipments of copper cyanide can now be regularly made from an entirely new source of domestic production.

The producing company is Copper Pigment & Chemical Corporation. Special control methods in their modern plant at East Newark, N. J., enables them to produce free flowing copper cyanide of exceptionally uniform quality, whiter in color than has usually been supplied in the past.

The entire amount of this new production will be sold through Kaynide Division under its Kaynide label. For additional information use Reader Service Card.

Free Data File . . .

Beckman application data

How Crown City Plating Company maintains high quality output with Beckman pH Equipment!

PROBLEM

Maintain precise pH control in nickel plating solutions for optimum brightness and durability.

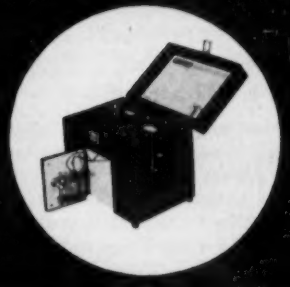
Bright nickel plating solutions are normally operated in a pH range of 2 to 3.5, depending on the formula used. Too

SOLUTION

The Beckman M
mounted on a p
room and elect
vide readings c
from the follo
pH Indicato
in the centre
are placed
control pa

BRIGHT NICKEL PLATING OPERATIONS—
one of many requiring accurate pH control!

Beckman Model G pH Meter is designed for precise analytical work. This is the model used at Crown City Plating Company. This rugged-battery-operated instrument features utmost accuracy for pH determinations, titrations and oxidation-reduction measurements. Accuracy is within 0.02 pH.



For full details on the above application see your Beckman Dealer, or write for Data File 61-72

COMPLETELY PORTABLE pH METER
Use this new portable battery-operated Beckman pH Meter anywhere in your plating operations. Low in price—lightweight and small in size—the Model N is ideal for economical, quick, yet accurate (0.03 pH) measurement.

. . . and for BENCH pH MEASUREMENT
The Beckman Model H2 pH Meter can be connected to any standard, 115-v power source and operated continuously, permitting instant measurements without repeatedly turning-on and adjusting instrument. Temperature compensation 0° to 100° C. Built-in voltage regulator.

BECKMAN INSTRUMENTS control modern industries

BECKMAN INSTRUMENTS, INC.
SOUTH PASADENA 1, CALIFORNIA
Factory Service Branches: New York—Chicago—Los Angeles

Beckman Instruments include: pH Meters and Electrodes — Spectrophotometers — Radioactivity Meters — Special Instruments

MAIL BOX

Subject: Volumetric Analysis of Zinc and Cadmium

DEAR SIR:

The recently published book by K. E. Langford, "Analysis of Electroplating and Related Solutions", answers a long-felt need in the plating industry for a text of chemical analytical procedures suitable for use by the plater. Because it is one of the very few books of its kind, it is sure to find immediate widespread use in the field. For this reason, it is important to bring attention to some errors in the text relating to the volumetric analysis of zinc and cadmium by the ferrocyanide method.

Langford gives the following equation for the reaction involved in the titration of an acidified zinc solution with potassium ferrocyanide:

$$3\ ZnSO_4 + 2\ K_4Fe(CN)_6 = K_2Zn_3[Fe(CN)_6]_2 + 3\ K_2SO_4$$

No equation is given for cadmium, but the implication given on page 25 is that a similar equation applies. Actually, however, the following equation is considered more correct for cadmium[1-2]:

$$CdSO_4 + K_4Fe(CN)_6 = K_2CdFe(CN)_6 + K_2SO_4$$

Langford suggests (page 327) that the potassium ferrocyanide reagents be standardized against zinc only, and that for cadmium analysis, a factor of 1.79 be applied. This figure is close to the ratio of molecular weights of zinc and cadmium (Cd/Zn 1.72). This factor would be correct if the equation given above for zinc were correct for cadmium also. However, as shown above, for every mole of ferrocyanide, 1½ moles of zinc are titrated, while only one mole of cadmium is titrated. The ratio of molecular weights now becomes Cd/1.5 Zn = 1.15.

Experiments were performed in this laboratory, in which the ferrocyanide was standardized separately against both zinc and cadmium metal. The source of zinc was c.p. granulated zinc. The source of cadmium was drillings from a ball anode. The ratio of the cadmium factor to the zinc factor was found to be 1.20, 1.23, 1.24, and 1.21 in four separate sets of standardizations. The average value of 1.22 agrees fairly well with the factor of 1.15 given above. In addition, the cadmium analysis was checked electrolytically. Thus, the use of Langford's factor of 1.79 for cadmium could lead to a serious error. Emphasis should, therefore, be made that if the ferrocyanide reagent is to be used for zinc analysis, it should be standardized against zinc, while if it is to be used for cadmium analysis, it should be standardized against cadmium.

Another error in the cadmium analysis as given by Langford on page 25 is that he recommends an ammoniacal solution for the ferrocyanide titration. Although the use of such a solution has been found, in our experiments, to lead to no great error in result, its use is definitely not to be recommended. In an ammoniacal solution, the outside indicator (uranyl acetate) develops a yellow precipitate at the commencement of the titration which masks the brown end-point. The solution should be made acid with an HCl-NH_4Cl mixture before titrating in order to get an accurate and clear end-point.

Another point which is overlooked by Langford, and which is rarely mentioned in other texts is the need for a "zero correction" when using uranyl acetate as an outside indicator. It happens that about 0.6–1.0 ml of ferrocyanide reagent (22 g/l) is required in order to produce the brown end-point, even in the absence of any zinc or cadmium. If the total amount of reagent titrated is 20–40 ml, the "zero correction" is not important to the plater. However, if the amount of ferrocyanide required to reach the end-point is 5–10 ml, the "zero correction" becomes important. It may be determined by going through the entire procedure for the determination of zinc as given by Langford on page 178, eliminating, of course, the sample of plating solution, and observing the amount of reagent which must be titrated in order to turn the outside indicator brown. If the "zero correction" is applied, the factor for the ferrocyanide solution (i. e., ml of reagent/g of zinc or cadmium) is a constant over a wide range. By experiment, we have found that the factor changes by less than 1 per cent over an eight-fold range of zinc concentration. These results refute the objection made by Silverman[3] to the use of a volumetric method for analyzing cadmium, who stated that the "factor" of a ferrocyanide solution depended on the number of ml titrated. In order to get reproducible results, however, the total volume of solution to be titrated, the amount of HCl and NH_4Cl added, and the temperature of the solution should be held reasonably constant.

Finally, it should be mentioned that only the alkali and alkaline earth metals, aluminum, and lead do not interfere with the titration. Thus, in analyzing alloy baths of zinc or cadmium, or in analyzing zinc or cadmium baths containing appreciable impurities, care must be taken to avoid interference with the titration. Thus, ferric iron may generally be removed by slowly adding ammonia to an acidified solution until a brown precipitate forms. Copper may be removed by precipitation as the sulfide by hydrogen sulfide in an acidified solution. Tin may be removed by volatilization as stannic bromide by adding a hydrobromic acid-bromine mixture and heating.

Summarizing:

1. The ferrocyanide reagent must be standardized against the metal being analyzed. The factor given by Langford for cadmium is unreliable.
2. The solution should be acidified with an HCl-NH_4Cl mixture before titrating.
3. If the amount of ferrocyanide reagent required for titration is less than about 20 ml, the "zero correction" must be applied.
4. As most metals commonly encountered in the plating tank interfere with the ferrocyanide titration for zinc or cadmium, they should first be removed if present in appreciable amounts.

References:

[1]Miller and Fisher, J. Am. Chem. Soc. **22**, 537 (1900).

[2]H. Weil, Z. Anal. Chem. **52**, 549 (1913).

[3]L. Silverman, Metal Finishing **47**, 5, 62–65 (1949).

EDWARD B. SAUBESTRE
Physics Laboratories
Sylvania Electric Products, Inc.

DEAR SIRS:

I have retired from active service in electroplating, due to poor health and age, but still continue as an active member in our local branch. I feel that PLATING with all its up-to-date information and although so much appreciated in past years it is not now of much value to me. You should discontinue sending it to me and send it instead to some younger plater who will use it to more advantage.

Thanks so much for past benefits, and wishing you continued success in its publications.

HENRY CAMERON
Rochester, N. Y.

The Branch Secretary has been asked to suggest a suitable recipient for the magazine.

Subject: Copper Striking on Die Castings

DEAR SIR:

For the past twenty years I have been associated with plating operations at some of the larger shops in New York City, and I feel I must comment on Mr. Hauseman's article on "Copper Striking Zinc Die Castings" which appeared in the October issue of PLATING.

STUDY THE FACTS!

ZINC with Luster-on IS SUPERIOR TO CADMIUM for most industrial applications

Preconceived notions that cadmium plating just naturally offers better protection than zinc are contrary to the true facts. Simply because cadmium is freer again is no reason for re-converting to it. Cadmium is still and always will be far more costly than zinc. When the zinc is passivated in Luster-on conversion treatment it is far superior to cadmium for all but extremely specific applications. These are basically (1) a marine atmosphere and (2) a bearing surface.

FACT NO. 1

ZINC plus LUSTER-ON is DEFINITELY SUPERIOR TO CADMIUM IN AN INDUSTRIAL ATMOSPHERE.

FACT NO. 2

ZINC plus LUSTER-ON is DEFINITELY MORE ECONOMICAL THAN CADMIUM.

BUT IF YOU MUST USE CADMIUM to meet specifications, the new LUSTER-ON Cd, specially developed to use on Cadmium plate, will give you a BETTER, BRIGHTER CADMIUM.

Write for free data sheets on Luster-on Treatments

THE Chemical CORPORATION
57 Waltham Ave., Springfield 9, Mass.

First of all, Mr. Hauseman's revelations are occurrences which should not be evident in a *hand operated line*, except at rare intervals and I do not feel that he was sufficiently clear in stating that these difficulties were not the usual thing.

For instance, why there should be chromium present in such concentrations that sodium hydrosulfite must be added every few hours, I cannot understand. I should think that Mr. Hauseman's first problem would be answered by stripping his racks after chromium plating. Improper rack design seems also to be one of the author's failings, since he is carrying over his cleaners, acid dips, etc. It must be evident that he experiences greater difficulties along the line. Again, should fluoboric acid be used, much of these problems would be overcome.

Mr. Hauseman displays a lack of proper plating technique if he is plagued (Mr. Hauseman is not. Ed.) by such difficulties as "brassy-color", "dull-plating", etc. In most cases proper technique in operating a strike and what is more important, the use of the proper strike will definitely minimize these experiences. I do not know, though I can guess which speed copper Mr. Hauseman is using. However, under no conditions is it advisable to place a wetting agent in the strike or for that matter in the acid dip. I further would not recommend the use of Rochelle salts in the strike, especially in his case for fear of carry-over.

This letter is not written to be malicious, but merely to correct, what appear to be, some of the author's inaccuracies.

GEORGE SCHORE

Editor's Comment

Mr. Hauseman's article referred to certain problems he had faced from time to time and told how he overcame them. As he reported in the article these problems vary from shop to shop. Undoubtedly most platers have been forced to overcome some or all of the difficulties mentioned, but it was not meant that these conditions were a continuing thing.

REAL SALES OPPORTUNITY

Here's a real opportunity for an aggressive man to earn more money. Well established chemical manufacturer has opening for outstanding sales representatives in the east and midwest. Complete line of alkaline and solvent emulsion type metal cleaners. Knowledge of metal finishing plating, etc. essential. Prefer man with selling experience. Car furnished. State age, previous experience, other qualifications. All replies will be held strictly confidential. Write Cowles Chemical Co., Metal Cleaner Dept., 7016 Euclid Avenue, Cleveland 3, Ohio.

Available for Immediate Shipment, Attractive Values

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS AND RECTIFIERS, WITH FULL CONTROL EQUIPMENT:

PLATERS

1—7500/3750 AMPERE, 6/12 VOLT, COLUMBIA, Synchronous Motor.
1—7500/3750 AMPERE, 6/12 VOLT, MUNNING "OPTIMUS".
1—6000/3000 AMPERE, 6/12 VOLT, CHANDEYSSON.
1—6000/3000 AMPERE, 6/12 VOLT, BOGUE.
2—5000/2500 AMPERE, 8/16 VOLT, ELECTRIC PRODUCTS, 25° C.
1—5000/2500 AMPERE, 8/16 VOLT, CHANDEYSSON, 25° C.
1—5000/2500 AMPERE, 6/12 VOLT, EAGER.
1—3000/1500 AMPERE, 6/12 VOLT, HANSON-VAN WINKLE-MUNNING CO.
1—2000/1000 AMPERE, 6/12 VOLT, MUNNING "OPTIMUS".
1—1500/750 AMPERE, 6/12 VOLT, HANSON-VAN WINKLE-MUNNING CO.
1—1500/750 AMPERE, 6/12 VOLT, CHANDEYSSON.
1—1000/500 AMPERE, 6/12 VOLT, CHANDEYSSON.

ANODIZERS

1—4000 AMPERE, 40 VOLT, CHANDEYSSON, Exciter-in-head.
2—1000 AMPERE, 30 VOLT, IDEAL, Exciter-in-head.
1—1000 AMPERE, 40 VOLT, CHANDEYSSON, 25° C.
1—500 AMPERE, 40 VOLT, M. G. C., Exciter-in-head.
1—400 AMPERE, 40 VOLT, M. G. C., Exciter-in-head.
1—500 AMPERE, 25 VOLT, CHANDEYSSON, 25° C.

RECTIFIERS

1—10,000 AMPERE, 12 VOLT, BRAND NEW G. E. COPPER OXIDE RECTIFIER, with Induction Voltage Control, for 220/3/60. Can also be rated: 20,000 ampere, 6 volt; 5000 ampere, 24 volt; 4000 ampere, 30 volt; 2000 ampere, 60 volt.
1—2000 AMPERE, 6 VOLT, G. E. COPPER OXIDE RECTIFIER.
1—GREEN SELECTOPLATER, 1800 AMPERE, 12 VOLT.
2—UDYLITE-MALLORY, 1440/720 AMPERE, 6/12 VOLT.

BUFFING LATHES

3 HP, 5 HP, 7½ HP and 10 HP DIVINE, HAMMOND, M. G. C., GARDNER, TWIN 5 HP and TWIN 7½ HP ROME, and other popular makes.

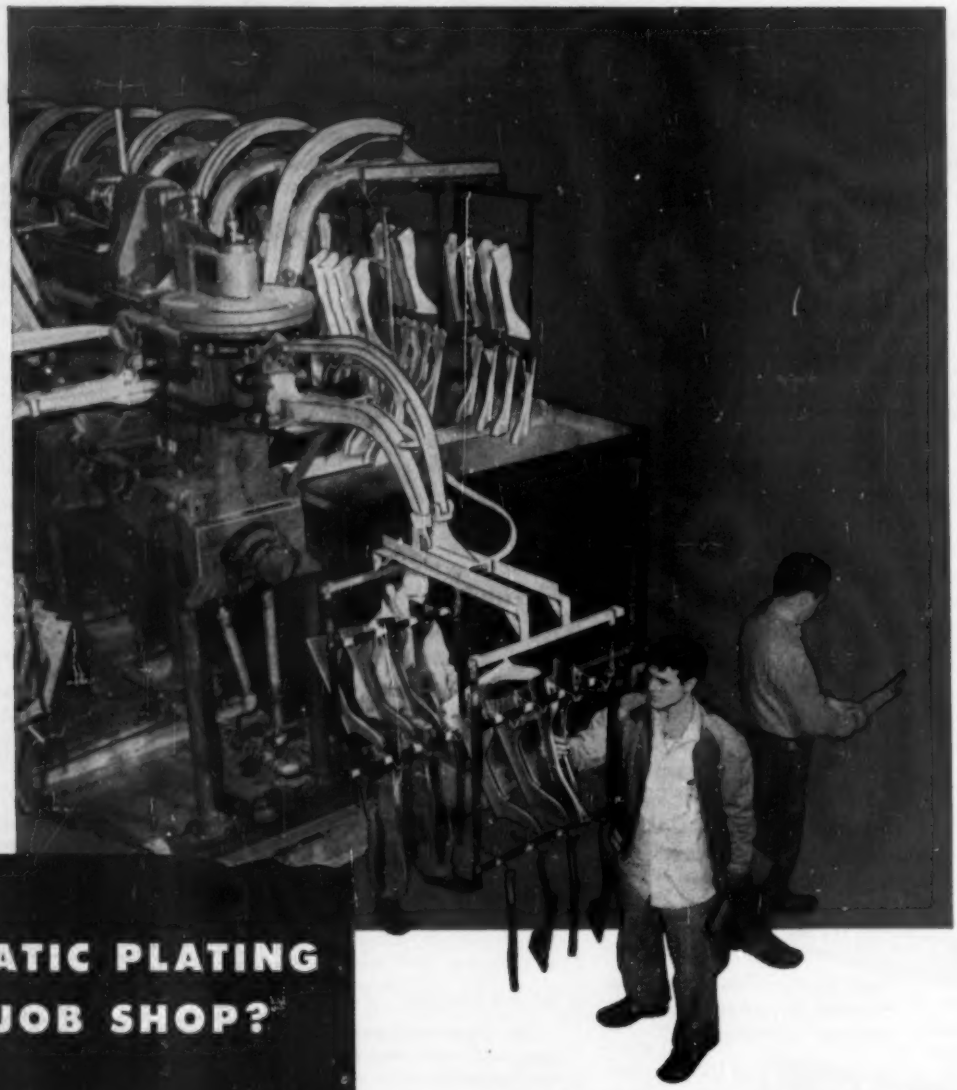
SPECIAL

1—MERCIL 12 x 12 CENTRIFUGAL DRYER, Elec. Heat.
3—24" and 30" BOBBINS & MYERS 2-SPEED VENTILATING FANS.
2—DIVINE & PORTER CABLE BACK STAND IDLERS.
1—ALMCO 2-COMPARTMENT 60" x 30" HORIZONTAL TUMBLING BARREL, with Motorized Shaker and Unloading Pan, like new.

Above is partial list only. Write to us for all your requirements for Plating, Anodizing and Metal Finishing.

Wire — Phone — Write

M. E. BAKER CO.
25 WHEELER STREET
Kirkland 7-5460 CAMBRIDGE 38, MASS.



AUTOMATIC PLATING IN A JOB SHOP?

"I'LL SAY SO! WE'VE FOUND STEVENS EQUIPMENT ENABLES US TO TAKE ON ALMOST ANY TYPE OF JOB."

That's what Mr. Louis S. Morse, Jr., president of Detroit Plating Industries, says about Stevens machines used in his modern plating shop.

Detroit Plating Industries has four Stevens machines in operation. Three are full automatic rack type, and one is a Stevens Automatic Barrel machine. With this equipment, Detroit Plating Industries get precise control of plate thickness – they handle a diversified group of products – and they can quickly shift from one order to the next.

Let Stevens show you how to up production . . . cut costs . . . in your job shop. Write FREDERIC B. STEVENS, INC., Detroit 16, Michigan.

FREDERIC B.
STEVENS
INCORPORATED
EVERYTHING FOR METAL FINISHING

BUFFALO, CLEVELAND, NEW HAVEN, INDIANAPOLIS — FREDERIC B. STEVENS OF CANADA, LTD., WINDSOR AND TORONTO

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 135.

plating

JANUARY, 1953 VOL. 40, No. 1

Contents

Better Electroplating Practice 42
Joseph B. Kushner

Polarographic Determination of Tin in Tin Plating Solutions 45
Rafael Diaz

Practical Experiences with Chromium Without Nickel Undercoats 47
D. Cam

Colorless Lacquers 48
J. Towner

A Theory of Hydrogen Overvoltage and Its Relation to the Electrodeposition of Metals 53
George Dubpernell and Roberta Dubpernell

The Determination of Boric Acid in Nickel Plating Baths 59
Earl J. Serfass, Robert B. Freeman and Edwin Pritchard

Washington Orders 63

The 40th Annual A. E. S. Convention—The Benjamin Franklin, Headquarters Hotel 64

Monthly Features

Advertising Index 99
A. E. S. Directory 96
A. E. S. News 78
Article Abstracts 68
Book Review 46
Branch News 78
Editorial 41
Equipment and Supplies 29
Future Meetings 100
Industry News 6
In This Issue 4
Mail Box 36
Membership Report 94
Patent Abstracts 73
Personals 16
Question Box 66
Society News 14
Trade Literature 26

Staff

Managing Editor
D. G. FOULKE

Editor
A. KORBELAK

Editorial Board
J. M. Andrus, E. R. Bowerman, E. T. Candee, F. Fulforth, W. Geissman, W. R. Meyer, L. M. Morse, C. W. Ostrander, E. A. Parker, R. B. Saltonstall, L. B. Sperry

Advertising
W. C. DIETRICH, *Manager*

LEE F. O'CONNELL, Western Representative (111 N. La Cienega Blvd., Beverly Hills 48, Calif.; 544 Russ Bldg., San Francisco 4, Calif.)

Production Manager
M. K. DICKINSON

This month's cover photo shows an aerial view of the grounds of the National Bureau of Standards, Washington, D. C., the location selected for work on Research Projects No. 9 and No. 13.

Published by the American Electroplaters' Society. Publication Office: 5800 N. Marvine Street, Philadelphia 41, Pa. Phone: LIvingston 8-7800. Editorial, Advertising and Executive Offices: American Building, 445 Broad Street, Newark 2, N. J. Phone: Humboldt 2-3400. Subscriptions: Domestic and Canada, $4.00 for 1 year, $7.00 for 2 years; 50c per copy; Foreign, $8.00 per year; $1.00 per copy.

Copyright, 1953, by the American Electroplaters' Society.

PLATING is abstracted regularly in Chemical Abstracts, Metallurgical Abstracts, Engineering Index, Technical Data Digest and Bulletin Analytique.

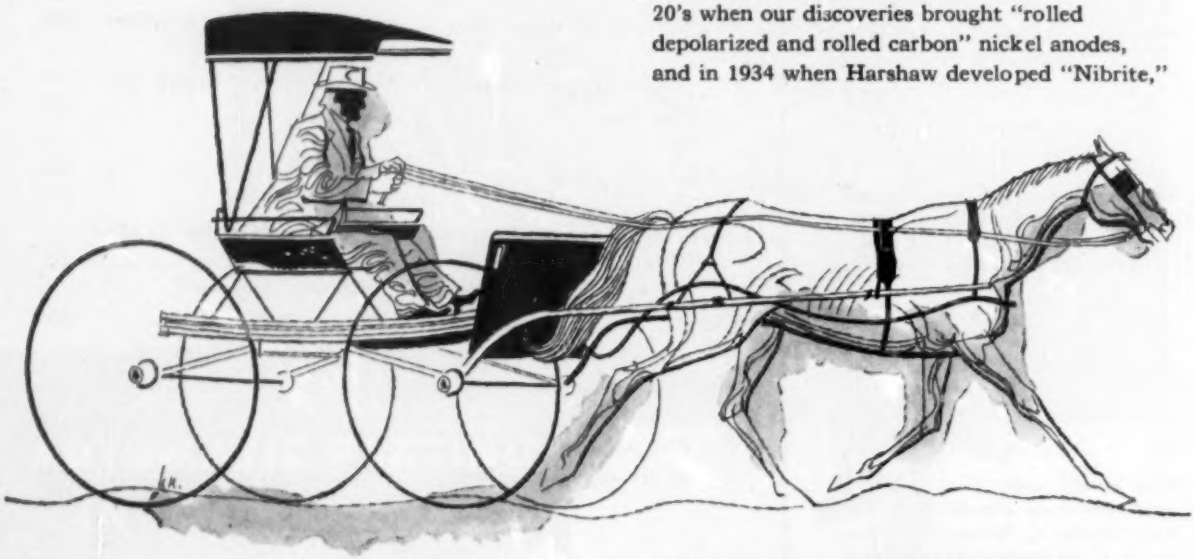
Perhaps

YOU WERE NOT YET BORN

when Harshaw first produced plating materials

Then again, perhaps you plated with Harshaw nickel as far back as the year 1898 . . . when we started producing for the plating industry.

If you are an old-timer, then you know first-hand the dependability of Harshaw plating materials. And you know how often Harshaw has been **FIRST** with important new developments . . . For instance, back in the 20's when our discoveries brought "rolled depolarized and rolled carbon" nickel anodes, and in 1934 when Harshaw developed "Nibrite,"



the first *bright* nickel. Harshaw installed the first commercial bright electroplating bath in 1935. That was a famous first, as you will recall. Of equal importance, too, were our introductions of fine crystal single nickel salts, and Perflow, the first truly leveling nickel deposit.

If you're a youngster, well then you should know more about us, and for that reason we have prepared a 16-page booklet which tells all about us—how thoroughly we serve the plating industry, and other major industries such as ceramic, petroleum, metalworking, paint, and others as well. Write for this free booklet. We'll be happy to send it.

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

Editorial

Know Thyself

EACH INDIVIDUAL and the management of every business should from time to time take stock of himself or the business as the case may be. The first step in any plan to improve a condition or a situation must of necessity be an objective study, a careful appraisal.

In an effort to serve the membership better, the Executive Board has had distributed to readers of PLATING a questionnaire asking for information with regard to the position held by the member or subscriber and the work done by his employer. A good response to this survey will guide the Executive Board and the Headquarters Staff along the path of better service.

If the Readership Survey form has not as yet been returned to the Newark office, it is requested that you do so now and, when replying, do not overlook the fact that a special request is directed to all members inquiring as to your desire for a complete index to PLATING and the *Proceedings*.

"Know thyself" is a good slogan for the individuals, companies and organizations alike. We are counting on you to respond to our request for information in order that we may know you better—you who make up the American Electroplaters' Society.

Franklyn J. MacStoker

Better Electroplating Practice

JOSEPH B. KUSHNER

Director, Joseph B. Kushner Electroplating School, Stroudsburg, Pa.

THE PAST twenty years have witnessed tremendous strides in electroplating techniques. Day by day, new processes and new methods have appeared that simplify the work of the plater. A promising start has been made in the application of atomic energy to plating problems and ahead lies a wonderful vista of astonishing scientific developments for helping the plater do things better. Theoretically, then, plating results should be better than ever—to paraphrase the movie slogan—but unfortunately that is not always true.

There are plating plants big and small, where hundreds and even thousands of dollars are wasted every week, in time, material and effort, on poor plating results. With monotonous regularity plating solutions go out of kilter, knocking production for a loss; with the same monotonous regularity blistering, peeling, cracking, spotting and staining raise their ugly heads to give both plater and management nightmares. And by the same token, poorly plated work goes out, to bring down the wrath of the customer on the plater in question and on plating in general.

Why should plating continue to suffer from the same ills that have plagued it since its beginning when we today have at our command the best that science and technology can give us? Simply because better plating practice, which is the basis for better plating results, does not depend on streamlined equipment, fancy machines or atomic doohickies. It depends on human beings. This truism is so obvious it is often overlooked. Platitude or not, however, no matter how clever the gadgets or how modern the equipment, if the platers who operate the machines and control the processes don't perform in the right way, results will continue to be poor.

The answer to the problem lies not in the physical sciences but in the psychological sciences. The way to better plating is to better the practices of the people who practice it.

This straightforward solution to the problem of better plating is not, however, the one usually chosen by management. Only recently has management begun to look around a bit in the uncharted fields of psychology and human relationships. More often than not management has decided that it is much easier and quicker to build and change machines than to build and change human behaviour. To that end, it unendingly seeks to eliminate "the human element." And in a way, management cannot be blamed. A machine will not go on strike, will not be envious of its fellow machine, will not be careless and negligent, will not pull production boners because its mind is on the Third at Hialeah or a nagging wife.

Thus we read in the news about projected "humanless" factories operated by "electronic brains"; about "thinking machines" that are so complex they can no longer be tended by a technician—they need a psychiatrist. And in university and industrial research laboratories men burn the proverbial midnight oil to perfect machines that perform like humans but don't act like them. It's an unhappy paradox that we're working mighty hard at the business of putting ourselves out of business because people don't believe in people.

Luckily, plating is complicated and it will be a while before the machines take it over tank, bus bar and generator. This gives the plater an opportunity to improve his practices and to prove to management that it might be better to invest in men instead of machines. With this end in mind, a study into what can be done to improve practices is indicated.

Some Mental Attitudes That Help

1. *Take an active interest in the work.* Plating is one of the most fascinating of all industrial arts. A world of mystery and miracles lies in the plating tank in front of them but many platers are oblivious of it. They stand and dip, walk and dip, stand and dip, walk and dip like automatons. To them it is a physically tiring and ennui producing job and nothing else. Tiring it may be, but boring—never. A plater who takes a mechanical attitude towards his work is imitating a machine and a machine is much more efficient at that than he is. On the other hand if a plater is actively interested in what he is doing, if he gives thought to it, no machine in the world can imitate him.

What does taking an active interest in the work mean? It means (a) thinking about the work and (b) learning more about it.

The thinking this writer refers to is not the "molded" variety which passes for the genuine article but the real thing, the kind produced by brain sweat. "Molded" thinking is rampant today. As a typical example of what is meant, consider the way public opinion is formed: People read a scare headline. "My," they

say, "this is awful" and after glancing at a few lines at the top of the column go on to the sports column or some other item. They have formed an opinion without true thought in those few seconds. On the other hand, if they had taken the trouble to read down through the fine print to the bottom and then to read between the lines they would have discovered that the scare headline was tendentious to the point of almost being misleading. It is in this way that public opinion is molded these days by newspaper publishers who appear to feel that people hate to think. And in a similar manner, opinionated radio and television commentators subtly or otherwise, mold people's thinking, using hot air pressure instead of the press.

"Molded" thinking sometimes occurs in plating as it does elsewhere. An expert writes something or designs a piece of plating equipment. The statements he makes may sometimes be dead wrong yet they may be printed and reprinted for years as gospel truth and accepted as such by non-thinking platers. Or the piece of equipment may have the most inefficient design ever conceived yet it is manufactured and used year after year by some of the industry, without question, because of lack of *thought* about it. The point is, the plater must look below the surface, have a little healthy skepticism, think for himself. This kind of thinking can prevent much of the waste and inefficiency that is prevalent in many plating plants today.

Many platers give lip service to the idea of learning more about their work. They say, "I read PLATING religiously every month" when actually, they skim through it in five minutes, then pick up the comics or turn on the television set. Or they say, "I took a course in analysing solutions. What more do I need?" What more indeed! A course in the analysis of plating solutions does not teach one about plating which is an odd mixture of a little electricity, a little chemistry and metallurgy, a little hydraulics and a lot of common sense. Analysis, while helpful in controlling plating baths, is usually learned by rote and does not give one an insight to the basic principles of plating.

Another lame excuse often advanced is, "I never got beyond grammar school. How can I learn anything about such a difficult subject?" Or, "If I had an opportunity to take a course I really would. I just haven't the opportunity." These excuses are just so much mental hogwash. A man who wants to learn more about his work does not need a college degree to do so and there are available today excellent residence courses in the metropolitan centers and good textbooks for self study for those who live away from the larger industrial areas.

An interesting lesson can be learned from the results of a contest which was run not so long ago, in which two free scholarships were offered in a home study training course in electroplating. Although this contest was publicized extensively and there are at least 60,000 production workers in the general plating field there were only about 200 entries. Of these, approximately 30 per cent were from production workers. The balance or more than twice as many, came from company executives, supervisors, chemists and engineers of whom there may be 6,000 as compared to the 60,000 production workers. One must conclude that this interest and desire to learn is what puts the executive where he is. Conversely, lack of interest and desire to learn is what keeps the tank man where he is!

2. *Be willing to accept new ideas.* In this world everything changes. What was good enough for a man's father is not necessarily good enough for the man. A plater must be willing to accept new ideas if they have merit, a plater must be willing to adopt new methods if they are better. It is a question of the open mind versus the closed one. If the plater does not make way for progress but instead blocks its path, as the saying goes, he is bound to get run over.

It is this writer's feeling that some of the men in the plating industry are rather backward about accepting new ideas. It is based on personal experience as a consultant only and no fancy statistics can be given to prove it but the following facts are offered for what they are worth: At a talk before a group of about sixty platers not so long ago, the writer posed the question, "How many of you use the Hull Cell for controlling your plating baths?" Only four hands were raised yet this simple aid to better results was made available more than ten years ago! Another question, aimed at the chromium platers, of which there must have been at least thirty present, asked "How many of you control the sulfate ratio by means of the bent cathode test?" Only one hand was raised! Yet this excellent control technique appeared in the literature over twenty years ago.

To drive the point home a more recent experience may be of interest. An article describing a simple device for measuring surface tension, developed by the writer with the plater in mind, appeared in an issue of PLATING. It was spread over three pages with an easy to understand story, a photograph and some diagrams. The writer received something like five inquiries as a direct result of the article. In a completely unrelated chemical magazine, lost in the middle of a page, were five lines of small type describing this new development. There were more than three hundred inquiries from this five line column and they are still coming in.

The plater must overcome mental inertia if he is to produce the best plating results.

3. *Treat the other fellow as you would want to be treated yourself.* The Golden Rule is the secret of good teamwork in the plating plant as it is everywhere else. More than anything, a human being wants recognition of one form or another, from his fellows. A human being wants to feel that he is needed and he wants to know that his work is recognized, no matter how slight his contribution may be. Give him that recognition, make him feel he is wanted and he'll give the best that is in him to whatever the group effort may be. It is a proven psychological fact that men like to work

in groups and that they work best in groups, but if the Golden Rule is not practiced in these relationships, results suffer.

The writer knows of a large plant on the Eastern seaboard where they have the latest production plating machines spread out over thousands of square feet of floor space. They have a beautifully equipped laboratory complete with two chemists and a laboratory assistant. But every Monday and Wednesday something goes wrong. If it isn't peeling or blistering it is flaking or discoloring. If a week goes by and they haven't lost at least $1,000 in production it's considered a minor miracle. They have the best equipment, the machines, the laboratory so why should this be? The answer is—no Golden Rule. There's no recognition of effort, no spirit of teamwork, only intrigue, discontent and suspicion. If a tank worker gets an idea, he feels his superior will grab the credit if it's a good one but will blame it on him if it misfires. The shift foremen mistrust the chemists and the chemists suspect the foremen of "foul play" and so it goes in an ever-widening vicious circle. At present this plant is making so much money it can afford to overlook the loss of a mere $1,000 a week or so but some day when pennies have to be pinched a little tighter, heads are going to roll. Not just those of the straw executives but those of the big shots as well because the production poisons of fear and hate spread from the top down and not from the bottom up.

Another attitude that is disruptive of teamwork in the plating plant is secretiveness. The day of abracadabra and hocus-pocus in electroplating vanished with the five-cent cigar but there are still many platers who don't realize it. There are still many foremen and supervisors who feel that teaching their apprentices and helpers something about what they are doing would be worse than sending the secrets of the "H" Bomb to Russia. This "now-you-see-it, now-you-don't" attitude is one that prevails in many plating plants. This writer is familiar with it not only by direct experience and observation but in a second-handed way through the letters which cross the writer's desk in the daily routine of conducting a correspondence training course in electroplating. To quote from a recent letter: "The man in charge of plating in our plant puts out very little information which would help anyone gain any knowledge of plating". Unfortunately, letters of this type outweigh by at least two to one those heaping praise on the foremen for being willing to share their knowledge and experience.

A plater who has to hold on to his job by secretiveness, bluff and double talk in the presence of his helpers should remember the wise words of Booker T. Washington: "You can't hold a man down unless you stay down with him".

4. *Work at the job not for what can be gotten out of it but for what can be put into it.* This principle, as old as the Sermon on the Mount, has been the basis for the success of all great men—whether measured in happiness or dollars. Many a plater will take on a job asking, "How much will it pay me" rather than "how much can I produce"? It is true that men have to eat, and also want the creature comforts for themselves and their loved ones, but when they sell their services at the highest market price they should keep in mind that by giving more than is demanded they will get more in the end. On the other hand, if the cart of money is placed before the horse of effort, progress is understandably slow.

Physical Environment Affects Mental Attitudes

Even though congeniality and a friendly atmosphere will cover a multitude of sins no one likes to work continuously under unpleasant physical conditions. While plating plants may never get to look like those spotless drug factories where "No Human Hand Touches Your Aspirin" there is no reason why plating shops have to be the filthy wet holes that some of them are. People react to their surroundings. Put even a good man in a sloppy set-up and the chances are before long that he'll be doing sloppy work. It is never safe to generalize but in this writer's experience it is these sloppy shops that run into the most trouble.

One big job shop owner known to the writer can't understand why he has such a big labor turnover and why his operations don't show a bigger profit than they do. He pays good wages and gives paid vacations —blandishments calculated to attract good workers. Yet he is plagued with profit eating rejects and a continuous labor turnover. An examination of the premises with impartial eyes gives the answer. The tanks are set along a dark wall and the few windows present are completely fouled up. They haven't been cleaned in the last fifteen years. The overhead lighting is so bad it's hard to tell the platers from the plating tanks without a score card. There are some half-rotted duckboards on the floor but duckboards don't do any good because the sewer openings are perpetually clogged so the floor looks something like the old swimming hole. The motto in this man's plating shop is obviously, "Sink or Swim"! Is there any wonder that sloppy work is done in such sloppy surroundings?

Many pages could be filled by listing these needless unpleasant things in the plating plant environment that could be corrected by a little good housekeeping: the bare plating racks that gain weight faster than a fat lady with a sweet tooth; the improperly hooded acid tanks; the poorly ventilated chromium tanks; the layouts, crazier than a miniature golf course. It is only natural that physical conditions such as these will react detrimentally on the mental attitude of the plater and thus adversely affect plating results. Conversely good housekeeping breeds better attitudes and better results.

The simple ideas enumerated here are ways in which we can better the practices of the people who practice plating. Let us practice them and get better plating results.

POLAROGRAPHIC DETERMINATION OF TIN IN TIN PLATING SOLUTIONS

RAFAEL DIAZ

Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

AN ANALYTICAL control method was needed for the rapid determination of tin in tin plating solutions from alkaline baths. A polarographic method was devised based on the conversion of stannate to hexachlorostannate with perchloric acid and sodium chloride and the subsequent reduction of the hexachlorostannate ion which gives a well defined diffusion current at about −0.47 volt. The same perchloric acid-sodium chloride mixture serves as supporting electrolyte. The procedure was satisfactory for control of plating solutions with only a few minutes required for a determination.

The iodometric determination of tin (IV) after reduction with metallic aluminum has been employed but with some difficulties being encountered in the routine application of this method because of the instability of the stannous tin and the necessity of titration in an inert atmosphere if accurate results were to be obtained. Furthermore, the *p*H of the solution is an important factor in the titration.

The reduction of the chlorostannic complex at the dropping mercury electrode has been studied by Lingane and Scott[1]. Their investigation revealed that solutions of stannic chloride in 2N perchloric acid in which the concentration of chloride is higher than 0.5N have a constant half-wave potential at −0.47 volt *vs.* the Saturated Calomel Electrode (S.C.E.). The magnitude of the diffusion current corresponds to the complete reduction of the chlorostannic ion complex to the metal. This is not surprising, since the reduction of the chlorostannous complex takes place at a more positive potential than the stannic complex.

It is of interest that the wave is only well defined when chloride in excess of 0.5M is added to the solution containing the tin in perchloric acid medium. This shows the importance of adding sufficient sodium chloride to avoid obtaining an unstable complex wave.

No attempt was made to measure the exact half-wave potential, but it is approximately −0.48 volt against a mercury anode, with a supporting electrolyte composed of 1.6M perchloric acid and 0.8M sodium chloride. The addition of 0.2 ml of 1 per cent gelatin solution helps to suppress any maxima due to oxygen and a better wave is thus obtained. The addition of too much suppressor may not only eliminate the maximum but also decrease the height of the wave which is being recorded. Kolthoff and Lingane believe this may occur when the concentration of gelatin is greater than about 0.01 per cent. In experiments leading to this report a concentration corresponding to about 0.008 per cent was used although no pains were taken to ascertain the "ideal" concentration of gelatin.

As far as is known the only possible interference in the development of the tin wave under the experimental conditions would be that of lead, which gives a diffusion current in chloride medium at a half-wave potential of −0.435 volt *vs.* Saturated Calomel Electrode (S.C.E.) (and this in 1M potassium chloride). Nevertheless, lead is not encountered in tin plating solutions except possibly as an impurity, in which case it would have no significant effect on the development of the tin complex wave. Typical polarograms of tin plating solutions are shown in Fig. 1.

Reagents and Apparatus

4M Perchloric acid solution
2M Sodium chloride solution
Gelatin, 1 per cent solution

Tin plating solutions for calibration were prepared by using standard analytical reagents: sodium stannate, sodium hydroxide, sodium acetate and hydrogen peroxide to maintain the valence of tin at its maximum of +4.

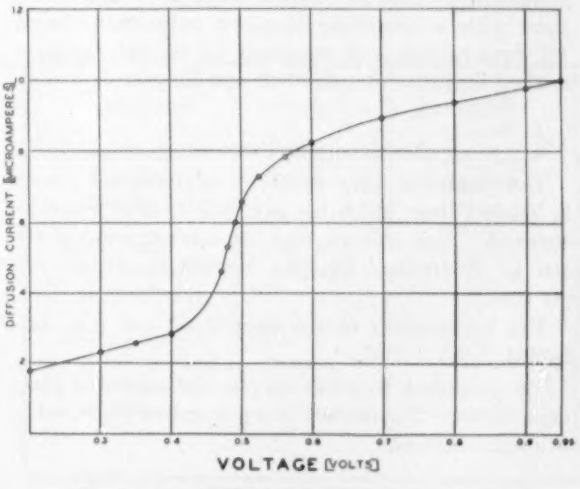


Fig. 1. Typical polarogram of a tin plating solution

A Sargent Model III polarograph was used for all the determinations.

Procedure

Calibration

Calibration curves were prepared by polarographing the synthetic tin plating solutions of known composition according to the procedure described for the analysis of the sample. Straight-line relationship was obtained between wave-height and concentration.

TABLE I. RESULTS OF ANALYSES OF TIN SOLUTIONS*

Solution Number	Amount Added	Volumetric Method	Polarographic Method
1	12.2	12.2	12.2
2	9.2	9.1	9.1
3	18.6	18.6	18.7
4	15.1	15.4	15.2
5	20.2	20.5	20.3

*Concentration of tin expressed in oz/gal.

Tin Plating Solution

Pipette 1.0 ml of the sample into a 100 ml volumetric flask, and dilute with water to the mark.

In a beaker, add 10.0 ml of 4M perchloric acid and 10.0 ml of 2M sodium chloride. Pipette a 5.0 ml aliquot from the volumetric flask and add it to the mixture in the beaker. Add 0.2 ml of a 1 per cent gelatin solution and stir to mix the components.

Use a 10.0 ml portion and record the polarogram between 0.0 and −1.0 volt of applied potential.

The concentration of tin, usually expressed as ounces per gallon is found by comparison of the height of the wave with a previously prepared calibration curve. All wave heights were measured by the extrapolation method illustrated by Kolthoff and Lingane[1].

Results and Discussion

The results of some synthetic mixtures are shown in Table I from which the calibration curve was constructed. They indicate that the concentration of tin can be determined by this method to within ±2 per cent.

The temperature of the electrolysis cell was controlled at 25° ±2° C.

The procedure is satisfactory in the control of plating solutions. The method is rapid and very adaptable to routine control.

LITERATURE CITED

[1]I. M. Kolthoff and J. J. Lingane, "Polarography", New York Interscience Publishers, 1941.

Book Review

DR. HAROLD J. READ

Professor of Metallurgy, Pennsylvania State College

Corrosion Testing Procedures by F. A. Champion, 1952, xi + 369 pages. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. Price, $6.25.

A comprehensive guide to the complex and often confused field of practical corrosion testing has long been needed, and Dr. Champion's book is a brave, and on the whole successful, attempt to fill this need. His object is to present those techniques which will interest chemists, engineers and others who are confronted with practical problems in the behavior of metals under service conditions or in the production of metals which will withstand specific environments. In this he has been eminently successful. His material has been well selected from the appallingly abundant literature, and it is presented clearly within a well organized and logical framework. As the author states, no effort has been made to cover the special techniques which are often required for fundamental or theoretical research. This is as it should be, for the inclusion of such procedures would not only make the book expensive as well as unwieldy but would cloud the clear presentation of practical techniques.

The presentation is logical in that it follows the chronological order of the various steps involved in any testing procedure. The selection and preparation of specimens are described first. Then come discussions of natural and artificial corrosion media, followed by extensive treatments of the laboratory, field or service conditions in which these media may be employed. After describing methods of cleaning specimens after corrosion, the author deals with the assessment of effects on both the metal and environment, and he concludes with a concise chapter on the presentation and interpretation of results. Each phase of the overall picture is presented briefly but in sufficient detail to enable the reader to understand what is involved. Every specific subject and test is documented with references to the literature; hence, those who are interested in manifold details are supplied with a guide to the pertinent original publication (to the tune of nearly 900 citations).

The book is truly international in flavor, for the author has selected his material on the basis of usefulness and applicability and without regard to the country of its origin.

There are, of course, some things that one might criticize, largely in the way of omission. It was noted, for example, that no mention was made of the supersonic thickness gages which are so useful in assessing loss of metal where only one side of a structure is accessible, whereas a cumbersome and not very satisfactory electrical apparatus for making such measurements is described.

The following paper was one of several presented this past spring at the Melbourne Branch Conference which had as its theme "alternative finishing procedures prompted by the critical shortage of nickel". It is reprinted here with the kind permission of the Defense Research Laboratories, Maribyrnong, Victoria, Australia, which published all the papers presented at that Conference in their volume "Plating Notes".

Practical Experiences with Chromium Without Nickel Undercoats

D. CAM*

CHROMIUM DEPOSITS obtained from the usual solutions are generally too thin and porous to protect the basis metal without the conventional nickel undercoat; however, deposits obtained from a special proprietary "cold" chromium solution are less porous and have good resistance to corrosion when plated on brass or zinc-base die-castings without an undercoat, or on steel with an undercoat of zinc. This "cold" solution has better throwing power and higher efficiency (25–30 per cent efficiency as against 12–15 per cent for the usual solution).

A current density of 100 amp/sq ft is satisfactory; with higher current densities the deposits become difficult to polish. Current is applied in a cycle, 7 seconds on, followed by 3 seconds off.

Plant

The same racks may be used that are used for nickel plating, but heavier racks are better when heavy currents must be carried for long periods. Some arrangements for water cooling the bath are necessary.

Cleaning Before Plating

A cleaning solution containing sodium hydroxide, 16 oz/gal, sodium cyanide, 32 oz/gal is recommended. The work is made cathodic, and the solution is used cold. Soaking in a hot alkaline cleaning solution as well is an advantage.

Buffing

Deposits from the "cold" chromium solution are a uniform dull bluish grey, but are easily buffed to a bright finish. Deposits become more difficult to buff with increasing current density and with lower chromic acid/sulfate ratio. With the bath operating correctly, the deposit is such that about 5 per cent of its thickness is lost during buffing. Stripping of rejects before replating is not necessary.

Physical Properties

Coatings deposited with a current density of 100 amp/sq ft have a hardness of 700 on the Knoop scale, compared with 900–1000 for chromium deposited from the conventional bath and 300–400 for nickel. "Cold" chromium deposits over brass or zinc-base die-castings, however, have poor scratch or abrasion-resistance, particularly when the coatings are less than 0.0001 inch in thickness.

This poor resistance to abrasion is probably caused by the combination of the thinness of the layer of chromium and the softness of the basis metal, and it does not occur when chromium is plated on steel with a zinc undercoat. These chromium deposits are not brittle, and they are suitable where bending or forming is done after plating.

Corrosion Tests

The results of some accelerated corrosion tests are shown in Table I.

Chromium coatings deposited on brass from the "cold" solution have given satisfactory protection indoors for up to one year.

TABLE I. ACCELERATED CORROSION TEST RESULTS OF COLD CHROMIUM COATINGS

Material	Salt Spray	Humidity
Brass, with chromium, 0.00005 in	24 hr, blistered	670 hr, not corroded
Brass, with chromium, 0.0001 inch	44 hr, not corroded	.....
Steel, with zinc, 0.001 in, and chromium, 0.0001 in	44 hr, a few white spots, easily rubbed off	670 hr, a few white spots, easily rubbed off

*Chemist, Turner Manufacturing Company, Ltd.

The following paper was one of several presented this past spring at the Melbourne Branch Conference which had as its theme "alternative finishing procedures prompted by the critical shortage of nickel". It is reprinted here with the kind permission of the Defense Research Laboratories, Maribyrnong, Victoria, Australia, which published all the papers presented at that Conference in their volume "Plating Notes".

Colorless Lacquers

J. TOWNER*

IN THE SURFACE COATING Industry, the word "lacquer" is generally taken to mean nitro-cellulose lacquer, but for the purpose of this paper all colourless film-forming materials used for surface coating will be referred to as lacquers, although they may be based on shellac, nitro-cellulose or synthetic-resin compositions, and they may be either air-drying or baking finishes.

The problem of supplying a finish that will be a satisfactory substitute for the conventional nickel/chromium electroplate is difficult for the surface coating manufacturer.

The requirements for a lacquer coating suitable for application over chromium or bright zinc electroplate may be summarized as follows: resistance to liquid water, resistance to water vapour, adhesion, abrasion resistance, flexibility, colour transparency and specular reflection, resistance to fats, oils, petrol, cleaning and polishing compounds, fruit juices, resistance to heat and ease of application. These properties are required not only in the newly applied film, but they must be retained, as far as possible, in the weathered or aged film. All of these properties cannot be obtained in one lacquer, and a compromise must be made.

The surface coating formulator cannot attack this problem by his orthodox methods. A standard paint system consists of a primer whose function is to promote adhesion to the underlying surface; and primers for ferrous metals contain so-called corrosion-inhibiting pigments. The next coat to be applied in a standard system is the undercoat, which has two functions. Firstly, the undercoat provides filling and it may or may not be sanded; architectural painting practice doesn't usually call for sanding the undercoats, but it is always done in the case of motor bodies. Secondly, the undercoat assists the finishing coat in presenting the required opacity. The final coat is a finishing coat, and its function is to present aesthetic appeal and weather protection to the surface.

The problem of providing a clear coating to protect chromium cannot be attacked this way, and neither can mechanical means of surface treatment be used in order to achieve adhesion as the metal surface must present a highly polished finish. The film applied to the chromium or bright zinc, as the case may be, must in itself provide a physical barrier, and this is the only means available for protecting the underlying surface. It could be said that an envelope of a plastic such as polythene or even cellophane could serve the same purpose, however, should the barrier be broken in any spot by mechanical abrasion, then moisture could run along underneath and corrosion would occur very rapidly, and such coatings are therefore unsuitable.

A good finish on chromium plate can be obtained, however, with a styrenated lacquer baked for one hour at 300° F. This finish has been tested in a salt spray cabinet for three weeks under conditions similar to A. S. T. M. Designation B117-49T, with 20 per cent sodium chloride solution and temperature of 75° F. The results suggest that this finish would be suitable in many applications, particularly bumper bar and other motorcar work, although not for some other purposes.

Two main types of lacquer offer possibilities. The first type is nitro-cellulose lacquer, which when correctly formulated exhibits satisfactory adhesion, hardness and toughness, and can be adjusted to the required flexibility. Colour and transparency are good, resistance to oil is excellent, resistance to cleaning compounds is fair, but heat resistance is limited. Resistance to outside weathering is not very good, and this is characteristic of un-pigmented lacquers. These lacquers are probably familiar to everybody and have

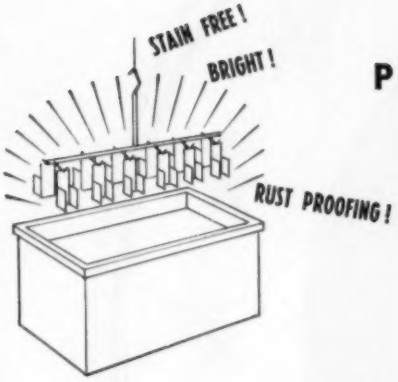
(*Continued on page 58*)

*Works Manager, Lewis Berger Pty. Ltd.

NEW! Magic Dry

Your answer to *Trouble-Free* PLATING

by Eliminating { STAINING
DULLNESS
RUSTING



PLATING

MAGIC DRY is a remarkable new product that helps eliminate rejects and increases production. In plating, MAGIC DRY is used in the rinse cycle in concentration of 1-2 ozs. for every 10 gallons of water 180° to 212° F. MAGIC DRY will eliminate plating stains and maintain the bright finish of the plated work. It will also provide a rustproofing finish that will be welcomed by the plating industry.

TUMBLING

Four ozs. of MAGIC DRY per gallon of water applied to tumbled parts at room temperature immediately after tumbling retains the bright finish of the tumbled parts and thereby prevents them from rusting or staining.

MAGIC DRY is now available in 55 gallon drums or 5 gallon containers.

★ ★ ★ ★ ★

Send for a sample of

Magic Dry

and be convinced

★ ★ ★ ★ ★

Mitchell-Bradford

Manufacturers of Black Magic blackening processes, Metal Cleaners, Rust Proofing Oils & Waxes, Heat Treating Salts.

THE MITCHELL-BRADFORD CHEMICAL CO.

2446T MAIN ST. STRATFORD, CONNECTICUT

QUALITY PRODUCTS OF CHEMICAL RESEARCH

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 137.

LET'S LOOK AT BOTH

TAILS ➧

PRICE

"There is hardly anything
in the world that some man
cannot make a little worse
and sell a little cheaper,
and the people
who consider price only
are this man's lawful prey."

Ruskin

INDICATE A 138.

SIDES OF THE COIN

◀ HEADS

W. GREEN ELECTRIC COMPANY, INC.

SELECTRO PLATERS AND ALL TYPES OF RECTIFIER EQUIPMENT

GREEN EXCHANGE BUILDING 130 CEDAR STREET NEW YORK 6, N. Y.

RECTIFIER (G) ENGINEERS

REPRESENTATIVES:

- Walker S. Buist, Indianapolis
- Crown Electrical Supply Co., Chicago
- Industrial Chemical & Equipt. Co., Minneapolis
- Manning & Manning, Newark
- Weaver Equipment & Supply Co., Houston
- W. M. Fothergill & Son, Buffalo

Which One?

They look alike—they are identical—yet one of these parts will wind up as a reject while the other will be the pride of the finishing room.

They both look clean and ready for finish—the difference is that one is "chemically" cleaned with job-adjusted Northwest products while the other got by with a fast dip and rinse.

The finish can be no better than the cleaning job beneath it. Why take a chance with haphazard methods and ordinary chemicals when it costs no more to be sure they're clean with a Northwest job-adjusted treatment?

Got a problem? Let our cleaning experts help you!

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 139.

"The chemical effects produced by electricity have been for some time objects of philosophical attention; but the novelty of the phenomena, their want of analogy to known facts, and the apparent discordance of some of the results, have involved the enquiry in much obscurity".

Sir Humphry Davy, The Bakerian Lecture, November 20, 1806.

A THEORY OF HYDROGEN OVERVOLTAGE AND ITS RELATION TO THE ELECTRODEPOSITION OF METALS*

GEORGE DUBPERNELL† and ROBERTA DUBPERNELL‡

Abstract

It is suggested that hydrogen overvoltage is probably not due to hydrogen at all, but to the electrodeposition of minute traces of alkali metals such as sodium. This is possible at low current densities due to the depolarizing effect of the metal of the cathode (tendency to form an alloy), and perhaps also to the forces of adsorption.

It is shown that the back electromotive force of polarization corresponds closely to the electrode potentials of alkali metal alloys, whereas no electromotively active form of hydrogen has been identified which is capable of generating these high negative potentials. Specific data are given for mercury-sodium and lead-sodium alloys, and it is pointed out that the metals with the highest cathodic overvoltage readily form alloys with the alkali metals such as sodium.

Measurements are reported with a Lucite Haring Cell, using sulfuric acid and water specially purified by distillation from iron stills, and maintained out of contact with glass. A somewhat lower polarization was found with platinum electrodes at low current densities, which was distinctly increased by a small addition of sodium sulfate corresponding to an amount of sodium to be found due to the solution of glass. A larger addition of sodium ion had little effect. The Haring Cell does not appear satisfactory for the measurement of the resistivity of pure sulfuric acid at low current densities, but gave good results at above about 5 ma/sq cm.

The history of the subject is reviewed, and it is shown that the new point of view is useful and agrees with observations in many fields. An explanation is offered of the banded structure frequently exhibited by bright electrodeposits.

Introduction

A theory of hydrogen overvoltage is proposed. It is suggested that this is not due to hydrogen at all, but to the electrodeposition of electronegative metal impurities such as sodium. This view has been held by many earlier workers, particularly during most of the 19th century, but is not included in current theories of hydrogen overvoltage, even though these are quite numerous and complicated[1,2,3].

This simple and useful concept of the primary deposition of sodium and secondary formation of hydrogen by reaction with water, was rejected by Le Blanc[4] and Ostwald[5,6] on the basis of Le Blanc's measurements of decomposition potential. However, Le Blanc's decomposition potentials are not single electrode potentials, and should not be given undue theoretical significance, as has been emphasized by Kortum and Bockris[7]. They are determined by measuring cell voltages including an IR drop, and include both the anode and cathode potential. If the cathode potential alone is measured with varying current density, one usually obtains a smooth hyperbolic curve with no evidence of any decomposition potential. Plotting the cathode potential against the logarithm of the current density gives the so-called "Tafel lines".

Thus the assumption that it is "thermodynamically impossible" to deposit sodium or other electronegative metals at less than a certain decomposition voltage is false. These metals may deposit at very low potentials if their deposition is facilitated by alloying

*Taken in part from the thesis submitted by Roberta Dubpernell (now Mrs. James M. Kelsh) in partial fulfillment of the requirements for the A.B. degree, University of Connecticut, June, 1951.

†United Chromium, Inc., Waterbury, Conn.

‡Formerly of the Naugatuck Chemical Division, United States Rubber Company, Naugatuck, Conn.

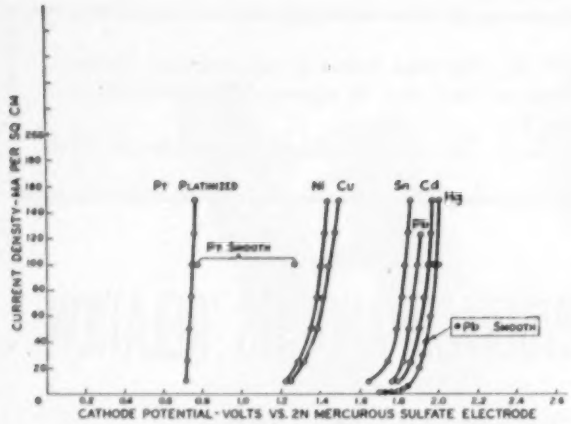


Fig. 1. Cathode potential—current density curves for hydrogen evolution on various metals in 2N H_2SO_4 at 12–15° C, taken from data of Tafel[11]

with the metal of the cathode, as when depositing on mercury. It is felt that in addition to the alloying effect, the deposition potential may also be lowered for the deposition of small quantities on a fresh metal surface, due to the unsatisfied valence forces of the atoms located in the metal surface, or the forces of adsorption.

Actually, sodium deposits on mercury at a lower potential than hydrogen, although this is not commonly recognized. Thus Classen and Danneel state[8] that: "The metals have namely a far lower potential than in the pure state if they are dissolved by mercury; therefore unnoble metals like the alkali metals can easily be electrodeposited, often easier than hydrogen"*. Again, Danneel states[9] that: "On account of the high overvoltage of hydrogen on the amalgam, sodium and potassium deposit easier on mercury than hydrogen, as long as the amalgam concentration does not become too high". This fact makes it possible to determine alkali metals electrolytically using a mercury cathode. Neuhausen[10] investigated the sodium amalgam electrode for the determination of low concentrations of sodium ion.

Many other electronegative metals in addition to sodium and potassium may be the cause of cathode polarization by depositing in small quantities. In addition to the alkali metals, the alkaline earths such as calcium are relatively common. Other electronegative metals such as magnesium and aluminum are also common in water, and may be involved in cathodic processes at potentials substantially lower than their reversible equilibrium potentials, in accordance with the theory here presented.

Hydrogen Overvoltage and the Potentials of Alkali Metal Alloys

Typical curves for the cathode potential during hydrogen evolution from 2N H_2SO_4 on various metals are shown in Fig. 1. These are plotted from the data of Tafel[11]. It will be noted that the curve for platinized platinum rises almost vertically at a single reproducible potential. This is the hydrogen electrode behavior, and the steepness of the curve at a single potential is a measure of how well the electrode has been "platinized".

Smooth platinum requires a higher cathode potential for hydrogen evolution at any given current density. This is the hydrogen overvoltage on smooth platinum at that particular current density. Tafel reported only a number of measurements at a single current density, 100 ma/cm², and the range of these is shown in Fig. 1 by means of a bracket.

The curves for copper and nickel show a moderate hydrogen overvoltage, slightly higher than the highest values found by Tafel for smooth platinum. The high overvoltage metals tin, lead, cadmium and mercury give curves falling in a group, with an overvoltage of one volt or more, and a maximum variation of the overvoltage from metal to metal of less than 0.2 volts at practically all current densities. Lead with a smooth, bright, buffed surface had the same overvoltage as mercury. The only common high-overvoltage metal omitted from this group is zinc. Tafel did not report measurements with it, but it is generally found to be in the same range as cadmium and mercury.

It is noteworthy that all of these high-overvoltage metals have a distinct ability to dissolve alkali or alkaline earth metals, and to alloy with them[12]. Thus it seems obvious that overvoltage is merely the back electromotive force of an electronegative metal such as sodium, dissolved in the surface of the cathode. The hydrogen overvoltage on lower overvoltage metals is merely the measure of the extent to which their surfaces can be charged with such electronegative metals.

This view seems to receive some confirmation also from the measurements of Ferguson and Kleinheksel[13], who found that there was a remarkably definite and reproducible "residual overvoltage" or back emf characteristic of each metal, regardless of the current density at which its surface was charged, if the initial rapid drop in polarization on opening the circuit was disregarded. This varied from very low values for platinum and palladium, to about 0.8 volt for zinc, as measured against the 2N mercurous sulfate electrode.

In order to compare the electrode potentials of some alkali metal alloys with hydrogen overvoltage, curves are given for mercury-sodium alloys, Fig. 2, taken from the data of Haber and Sack[14], and for lead-sodium alloys, Fig. 3, based on measurements made by Kremann and Reininghaus[15]. Extensive additional data of this type may be found in the publications of

*This translation as well as others quoted in the text are by the authors of this paper.

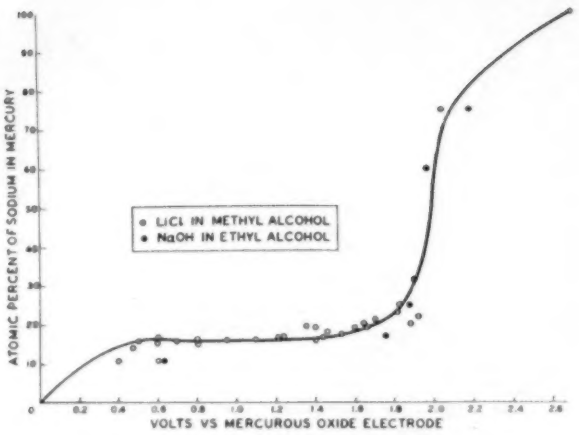


Fig. 2. Potentials of mercury-sodium alloys at −80° C, taken from data of Haber and Sack[14]

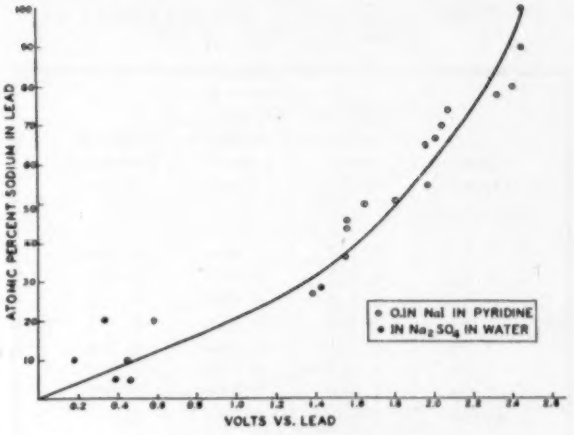


Fig. 3. Potentials of lead-sodium alloys at room temperature, taken from data of Kremann and Reininghaus[15]

Kremann and his co-workers, and in Kremann's books[16,17].

It may be noted from Fig. 2 that the potentials of mercury-sodium alloys of a wide range of composition are of the same order of magnitude as the high hydrogen overvoltage on mercury. Again in Fig. 3 the entire range of potentials exhibited by cathodically polarized lead is shown by the various alloys of lead and sodium. Haber and Sack[14] also investigated lead-sodium alloys, and conclude (p. 248) "from the agreement of the potential values, from the behavior of chemically prepared noble and unnoble lead-sodium alloys in water, and from the simultaneous occurrence of brisk current flow and brisk hydrogen evolution at the same time as the surface disintegration or turning dull of the lead cathode, that the escape of the positive current in caustic soda solution is fundamentally bound up with the formation and later decomposition of sodium alloys of the cathode material. In the main, hydrogen evolution on these cathodes is accordingly secondary".

Haber and Sack likewise obtained similar results with tin cathodes and tin-sodium alloys, and conclude that: "We have finally again here the disintegration of the cathode surface as a confirmation that the hydrogen evolution is actually the secondary cathodic phenomenon. We conclude again that the escape of the positive current from the caustic soda solution at the tin cathode is essentially bound up with the formation and secondary decomposition of the sodium alloy of the tin".

Sack published a more detailed later paper[18] in which he showed ". . . that polarization phenomena are in fact to be explained by the intermediary formation at the cathode of the same sodium alloys which we have been able to prepare chemically by melting lead or tin together with sodium". In discussing the greater surface disintegration observed on platinum cathodes in acid rather than in alkali, he states that "Therein lies incidentally a chemical proof for the secondary origin of any substantial hydrogen evolution on platinum cathodes in sodium hydroxide solution, since with primary discharge of hydrogen the same surface disintegration must necessarily be expected in both acid and in alkali".

Experimental

In order to attempt to check the concept of cathode polarization presented here, it was decided to purify water and sulfuric acid by distillation out of contact with glass, using Armco iron stills fabricated by welding with pure nickel welding rod. The pure water and sulfuric acid thus obtained were stored in polyethylene containers. The water was obtained from a block tin still, and thus was twice distilled from metal rather than glass surfaces, in order to avoid the presence of negative metal impurities as much as possible.

Using the pure materials, approximately 2N H_2SO_4 was made up. This could not be done exactly because glass measuring equipment could not be used. An accurate titration after the measurements showed the actual concentration to be 1.67N. This 1.67N H_2SO_4 was electrolyzed at about 35° C between platinum electrodes in a specially constructed Haring Cell[19,20], made of Lucite. The inner dimensions of the cell were about 2.54 cm x 2.54 cm (1 in x 1 in) cross section of solution, and 7.62 cm (3 in) length. The area of the sheet platinum electrodes exposed to the solution at each end of the cell was about 2.54 cm x 2.54 cm (1 in x 1 in). The evenly spaced sheets of platinum gauze forming the center compartment covered the same area, and were made of 52 mesh 0.004 in platinum wire.

The potentials of the cathode compartment and the center compartment were measured with a Leeds and Northrup Students Potentiometer. The current was

TABLE I. RESULTS WITH PUREST 1.67N SULFURIC ACID

Current Density ma/sq cm	Cathode Compartment Volts (E + IR)	Center Compartment Volts (IR)	Cathode Potential Volts (E)
0.155	0.197	0.007	0.190
0.310	0.417	0.007	0.410
0.775	0.759	0.009	0.750
1.55	0.790	0.019	0.771
3.88	0.849	0.049	0.800
7.75	0.928	0.091	0.837
15.50	1.069	0.149	0.920
46.50	1.60+	0.40	1.20

TABLE II. RESULTS WITH 0.0057 g/l Na_2SO_4 ADDED TO PUREST 1.67N SULFURIC ACID

Current Density ma/sq cm	Cathode Compartment Volts (E + IR)	Center Compartment Volts (IR)	Cathode Potential Volts (E)
0.155	0.180	0.008	0.172
0.310	0.687	0.007	0.680
0.775	0.747	0.017	0.730
1.55	0.776	0.034	0.742
3.88	0.826	0.084	0.742
7.75	0.914	0.140	0.774
15.50	1.037	0.197	0.840
31.00	1.358	0.341	1.017
46.50	1.60+	0.45	1.15

TABLE III. RESULTS WITH 7.1 g/l Na_2SO_4 ADDED TO PUREST 1.67N SULFURIC ACID

Current Density ma/sq cm	Cathode Compartment Volts (E + IR)	Center Compartment Volts (IR)	Cathode Potential Volts (E)
0.155	0.462	0.002	0.460
0.310	0.695	0.005	0.690
0.775	0.796	0.010	0.786
1.55	0.820	0.029	0.791
3.88	0.869	0.090	0.779
7.75	0.942	0.133	0.809
15.50	1.081	0.207	0.874
31.00	1.361	0.324	1.037
46.50	1.60+	0.44	1.16

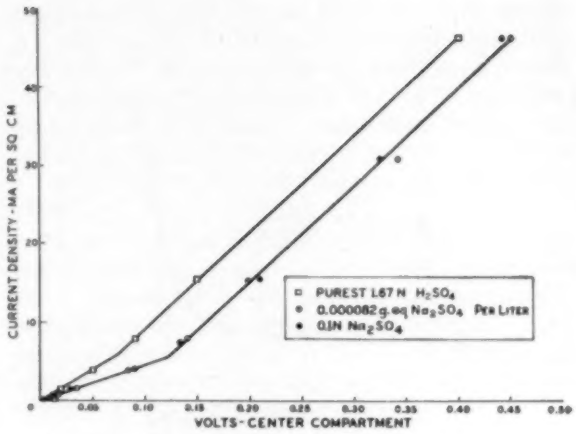


Fig. 4. IR drop in center compartment of Haring Cell versus current density

measured with several Weston milliammeters checked against each other. The individual measurements at different current densities were made as rapidly as possible after the current started to flow. This required from one to two minutes, when the current was interrupted until the next measurement. Successive measurements were started at exactly five-minute intervals, giving a period with no current flowing of at least three minutes in each case. Each measurement was repeated at least once, and the reproducibility was usually quite good, generally within a few millivolts. The maximum variation of duplicate measurements was about 10 millivolts.

A number of tests were made to determine the effect of stirring the center and cathode compartments with a Vinylite rod, on the potentials measured. Very little effect was found, and therefore no stirring was used during the measurements. The electrolyte was generally stirred once when the current was off between measurements, to minimize any concentration or temperature changes due to electrolysis.

The water and sulfuric acid probably contained some iron from the iron stills, but it was felt that this could be disregarded from the point of view of electromotive activity. No iron deposit was noted on the cathode during the tests.

These tests were to a considerable extent engendered by somewhat similar work done by Bowden[21], who used mercury cathodes principally. Bowden used wax-lined and silica apparatus to avoid the effect of glass, and was able to show that high potentials on mercury cathodes were due to the deposition of negative metal impurities such as sodium, even though he used a glass exploring electrode tip for the measurement of potentials which was filled with saturated KCl, and must have had contamination with sodium and potassium from this source. Strangely enough, he did not consider the mechanism of hydrogen overvoltage in his paper, and felt that his measurements

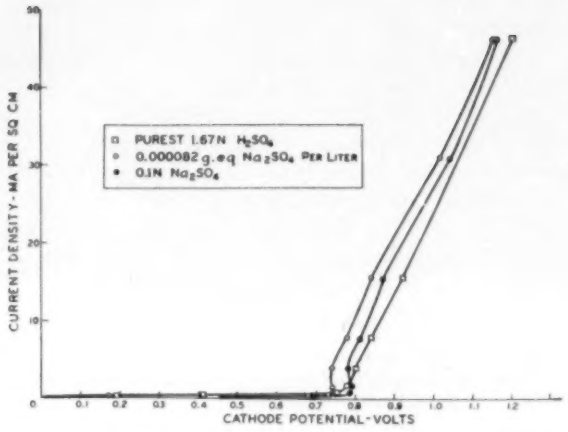


Fig. 5. Cathode potentials versus current density as measured in Haring Cell

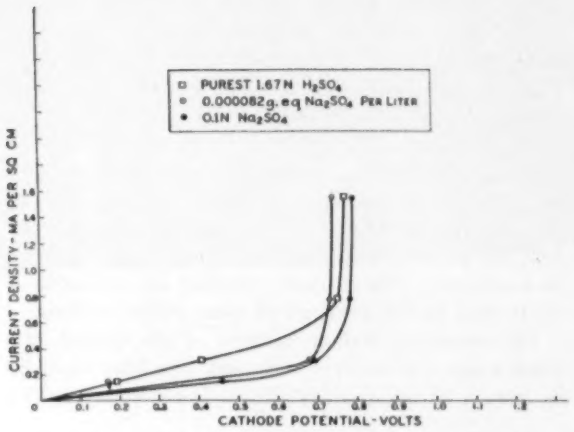


Fig. 6. Cathode potentials at low current densities in Haring Cell

could throw little light on true hydrogen overvoltage.

Measurements from the experimental work above are reported in Tables, I, II and III, and in Figs. 4, 5, and 6. Table I and the curves show the results of measurements in the purest 1.67N sulfuric acid solution. At the lowest current densities the IR drop measured in the center compartment shows a linear variation with current density, as would be expected. At moderate current densities slightly above that at which visible hydrogen evolution begins on the cathode in the end of the cell, the IR drop takes a new trend and seems to follow a new linear variation with current density.

The effect was then checked of adding an amount of Na_2SO_4 corresponding to a quantity of sodium which might ordinarily be obtained due to the solubility of glass. A figure of 0.000082 g equivalents of sodium per liter dissolved in water by boiling it in contact with Pyrex glass for one hour had been given the senior author verbally at the University of Michigan many years ago, and it was decided to use this amount which checks with quantities given by Dole[22]. It is about eight times the amount of sodium which Bowden found sufficient to give a high cathode potential to a mercury cathode.

The measurements in Table II were accordingly made after the addition of 0.0057 g/l of Na_2SO_4. This was done by making up a stock solution of the proper concentration, and adding 1 ml to the 50 ml of 1.67N H_2SO_4 in the Haring Cell. The addition had a very pronounced effect. It was evident particularly in the measurement of the IR drop between the gauzes of the center compartment. At low current densities the slope of the curve changed, corresponding to a change in resistivity of the 1.67N H_2SO_4 from about 5 ohm-cm to about 8.5 ohm-cm. Since no appreciable change in resistivity of the solution would be expected, it seems that the gauzes were polarized down to the very lowest current densities.

Calculating the resistivity of the 1.67N H_2SO_4 at 35° C from the slope of the upper branches of the curves in Fig. 4, gives about 3.2 ohm-cm. This agrees very closely with the same value obtained by interpolation from the data for 18° C given in International Critical Tables[23], or the value of about 3.1 ohm-cm which is estimated for 1.67N H_2SO_4 at 35° C from the data in the same source. It would appear that the curves for IR drop in the center compartment of the Haring Cell are shifted a constant amount by electronegative impurities, and that with sufficiently pure acid the theoretical straight line starting at the origin would be obtained.

A third series of measurements was made with the addition of a substantial amount of anhydrous sodium sulfate sufficient to make the solution 0.1N in Na_2SO_4. The dry chemical was dissolved by stirring with a Vinylite rod. The actual amount added was 0.355 g in the 50 ml Haring Cell, or 7.1 g/l. The results are given in Table III and it may be noted from Fig. 4 that the measurements of IR drop in the center compartment were substantially identical with those in the second series with 0.000082 g equivalents of sodium per liter added.

The cathode potential was computed in each case by subtracting the IR drop measured in the center compartment from the potential of the cathode compartment, even though the potential of the center compartment appeared to include some polarization. The results are given in Fig. 5, and do not seem especially significant. *At higher current densities* the purest 1.67N H_2SO_4 solution showed the highest cathode potentials and the second series with a minute addition of Na_2SO_4 the lowest, with the third series with 0.1N Na_2SO_4 showing intermediate values. The slope of all three curves indicates that they include some IR drop.

The cathode potentials *at low current densities* were more variable, and are plotted on a larger scale in Fig. 6. It was noticed that the rate of charging of the platinum cathode was much higher in the solut-

ions containing Na_2SO_4 than in the purest sulfuric acid, and the cathode potential rapidly rose to fairly high values, even at the lowest current densities. The only exception was the measurement at the lowest current density when only a minute amount of Na_2SO_4 was added. In this case the cathode did not seem to charge more rapidly or to a higher potential than with no sodium added, in the 10 or 15 seconds used for each measurement. However, the measurement at the next highest current density exhibited the rapid sweep to a relatively high cathode potential characteristic of electrolysis in the presence of some added sodium.

The remaining sodium content of the special distilled water and sulfuric acid used was later checked by means of the Barclay Flame Photometer*. The water contained no measureable amount of sodium. Since the instrument gave a large scale deflection with 1×10^{-5} g eq/l of sodium added, it appeared that the water probably contained less than 1×10^{-6} g eq Na/l. The sulfuric acid was tested in 2N strength, and appeared to contain about 1×10^{-5}g eq Na/l in this solution. About the same concentration was found in 2N sulfuric acid made up from the ordinary concentrated c.p. acid in glass bottles. Apparently no purification of the sulfuric acid was achieved by distillation, probably due to the high temperature required.

(To be continued)

*Manufactured by the Patwin Instrument Division, Patent Button Company, Waterbury, Conn.

Colorless Lacquers

(Continued from page 48)

been used in a limited way in the plating trade for many years, particularly when coloured with light-fast dyestuffs, and also when used over brass plating on handbag fittings and the like.

The second type of finish is based on synthetic resins. As mentioned earlier, all major types of synthetic resins are available to Australia, but the choice comes down to modified alkyd resins, with or without the addition of amino resins, depending on the required degree of hardness and durability. Amino resins are water-white and extremely hard, but their water-resistance and outside durability are not very good.

Application is usually by spraying although in some instances dipping could be used. Brushing would not be very satisfactory, because it is difficult to apply an absolutely uniform film in this way. Drying almost without exception would have to be by stoving (baking) for three reasons. Firstly, to achieve necessary hardness; secondly, to achieve rapid drying coupled with durability and lack of brittleness. However carefully a room is dust-proofed, a film will pick up considerable dust, and its final appearance would not be acceptable if dried slowly. A third reason is that, because of the nature of the drying process, stoved films are more water-resistant than are air-dried films.

Modified alkyd resins also present excellent outdoor weather characteristics with minimum film thickness. Films must be thin if the coated article is to resemble an orthodox plated surface. Light striking a plated surface undergoes specular reflection with no refraction and relatively little scattering. A heavily lacquered surface, however, must introduce refraction and it can introduce considerable scattering. Styrene possesses many of the particular properties required for this work. An excellent paper on the mechanism of the protective action of an un-pigmented film of polystyrene appears in the October, 1949, issue of the Journal of the Oil & Color Chemists Association, where it is shown that un-pigmented styrene films conferred much better corrosion resistance than those pigmented with orthodox recognized anti-corrosive pigmentations. The view was put forward that the polystyrene film interposes a high ionic resistance between the anodic and cathodic areas on the surface of the iron, and that the corrosion current is thereby reduced to a small value. A straight polystyrene film would not have sufficient adhesion, and modification, that is chemical combination of styrene with selected drying oils in the form of alkyd resins, seems to offer a solution to the problem.

The plated surface must be thoroughly clean before application of a lacquer finish. All traces of buffing compounds must be removed and it is desirable to finish with a dry clean buff. Immediately before lacquering, the surface should be slicked over with a cloth (preferably silk, which won't shed fibre) soaked in a grease solvent.

First class equipment is essential. Spray equipment manufacturers should be called in to give advice, because first class work cannot be turned out with second rate spray equipment. A skilled operator is also necessary, but this is not a major problem because most workshops have a man who rapidly becomes adept as a spray hand. All spray work should pass through his hands, and he should be responsible for the quality, workmanship, maintenance of equipment, etc.

A relatively wide choice of equipment is available, and means of heating can be electric, gas or fuel oil, and a choice of radiant heating (so called infra-red) or convection ovens can be used. Much will depend on the particular articles to be treated, their size and shape, and the layout of the particular shop in which they are to be used. In general, convection ovens are preferred, because shortly after spraying, the articles can be placed in the oven, and they are then sealed away from possible dust contamination. Baking ovens must be carefully designed.

project no. 2

project director:
EARL J. SERFASS*

associates:
ROBERT B. FREEMAN*
EDWIN PRITCHARD*

location:
LEHIGH UNIVERSITY,
BETHLEHEM, PA.

Acknowledgment is due the Research Committee, Dr. Donald Price, Oakite Products, Inc., Chairman; the Research Directing Sub-Committee, Mr. Walter Pinner, Houdaille-Hershey Corporation, and Mr. George Jernstedt, Westinghouse Electric Corporation, Chairman and Supervisor, respectively; and the Project Committee, Dr. Walter R. Meyer, Enthone, Inc., Chairman, and Mr. Robert A. Ehrhardt, Bell Telephone Laboratories, Mr. George Best, Mutual Chemical Company of America, and Dr. W. D. Hatfield, Decatur, Ill., for their contributions to this project.

*AUTHORS

THE DETERMINATION OF BORIC ACID IN NICKEL PLATING BATHS

The following paper represents the first of a series to be released by Project No. 2 on the determination of plating constituents occurring in macro amounts. This study was undertaken to evaluate the current methods employed to determine the important plating solution constituents with the object of improving them where possible.

Research Directing Committee
Project No. 2

Introduction

During the progress of the work of Project 2 on macro methods of analysis an improved method for determining boric acid in a nickel plating bath was developed. The standard method now in use involves the titration of boric acid in the presence of nickel by standard alkali. The addition of mannitol is necessary to transform the weak tribasic boric acid into a stronger monobasic acid which can be titrated with standard alkali.

$$C_6H_{14}O_6 + H_3BO_3 \rightarrow C_6H_{12}O_6.BOH + 2H_2O$$

The indicator generally used for this titration is a mixture of bromthymol blue and bromcresol purple.

Phenolphthalein is the recommended indicator for the determination of boric acid as a monobasic acid but cannot be used in nickel solutions due to the hydrolysis of nickel to form $Ni(OH)_2$. An improved method for the determination of boric acid by eliminating the interference of nickel is desirable.

There are three ways of removing nickel to prevent its interference: (1) deposition by electrolysis, (2) precipitation, and (3) formation of complex nickel compounds.

The elimination of the nickel by precipitation was selected as being the simplest of three methods listed above. The separation of the nickel by precipitating the ferrocyanide was found to be satisfactory and the filtration of the nickel ferrocyanide found to be unnecessary. This improved method consists of (1) precipitation of the nickel as ferrocyanide, (2) titration with standard alkali to a bromcresol purple endpoint to determine any mineral acid which might be present, (3) conversion of the weak tribasic boric acid to a strong monobasic acid, and (4) titration with standard alkali to a phenolphthalein endpoint.

Developmental

A solution of 0.1 *N* NaOH was preprepared and standardized against potassium acid phthalate, and a solution of 0.1 *N* boric acid was prepared from the crystallized salt that had been dried IN VACUO. The boric acid solution was titrated with the NaOH using phenolphthalein and mannitol. In order to establish the *p*H

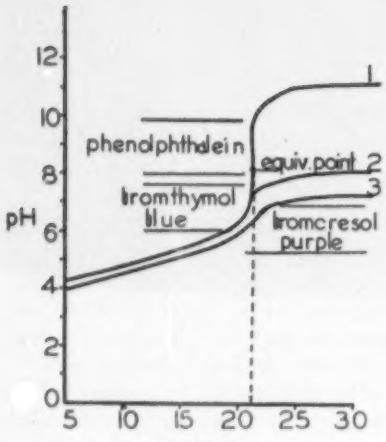


Fig. 1. Curve 1—Boric acid-sodium hydroxide titration curve when nickel is absent

Curve 2—Boric acid-sodium hydroxide titration curve in presence of 0.5 g $NiCl_2.6H_2O$

Curve 3—Boric acid-sodium hydroxide titration curve in presence of 2 g $NiCl_2.6H_2O$

curve for the neutralization of boric acid by NaOH in the presence of mannitol, the titration was repeated using a Beckman *p*H meter to establish the curve. The results of this titration, shown as Curve No. 1, Fig. 1, clearly show that

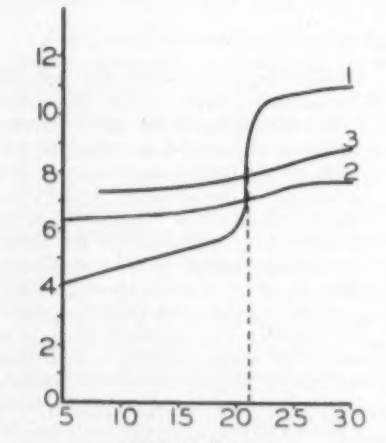


Fig. 2. Curve 1—Boric acid-sodium hydroxide titration curve when nickel is absent

Curve 2—Boric acid-sodium hydroxide titration curve when the nickel present is precipitated by sodium fluoride

Curve 3—Boric acid-sodium hydroxide titration curve when the nickel present is precipitated by sodium citrate

boric acid acts like a strong acid in the presence of mannitol.

Obviously, a minimum amount of mannitol is necessary to cause boric acid to perform as a strong acid. According to Hollander and Rieman[1], the optimum concentration of mannitol at the endpoint is 0.35M. For the method of analysis for boric acid recommended below, a 1.75 molar solution of mannitol must be added in order that final mannitol concentration will be at least 0.35 M. Since mannitol has a solubility of about 150 g per liter at room temperature and 318 g per liter would be necessary for a 1.75 molar solution, it will be necessary to use a suspension of mannitol in carrying out the analysis.

Effect of the Presence of Nickel

To obtain the three curves of Fig. 1 20 ml of 0.1 N H_3BO_3, 10 ml of mannitol and indicator or impurities (Ni) were titrated with 0.1 N NaOH. Curve 1 shows the indicated endpoint obtained in the absence of nickel. Curve 2 shows the endpoint obtained when 0.5 g $NiCl_2.6H_2O$ was present. Curve 3 shows the endpoint obtained when 2 g $NiCl_2.6H_2O$ were present. The equivalence point for boric acid for all the curves is seen to be at approximately 21.0 ml NaOH.

On Fig. 1 are placed the ranges of the indicators used in the standard methods, i. e., bromthymol blue, bromcresol purple and phenolphthalein. It can be seen that only phenolphthalein changes color near the equivalence point for boric acid. The others either separately or together can not give the true equivalence point although they may yield a fairly good endpoint if a particular color is used each time.

A consideration of the curves of Fig. 1 shows an endpoint cannot be obtained in the presence of nickel with phenolphthalein as an indicator.

Precipitating Agents

It seemed desirable, therefore, to tie-up the nickel in some manner so that it would not interfere by precipitating out as the hydroxide thus permitting the use of phenolphthalein as the indicator.

A saturated solution of sodium fluoride was first tried as a precipitating agent. A titration with standard alkali and a *p*H meter was performed on a solution containing 200 ml of saturated sodium fluoride solution, 20 ml of 0.1 N H_3BO_3, 60 ml of 1.75 M mannitol solution and 2 g of $NiCl_2.6H_2O$. From curve 2 of Fig. 2 it can be seen that sodium fluoride is unsatisfactory as a precipitating agent.

Sodium citrate was tried next as a complexing agent. The procedure was the same as with the sodium fluoride addition except for the addition of 140 ml of saturated sodium citrate solution. Curve

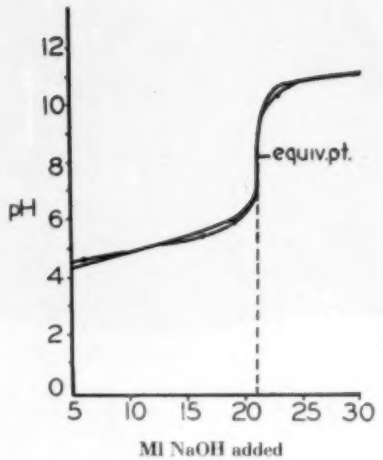


Fig. 3. Smooth curve is boric acid-sodium hydroxide titration curve when nickel is absent

Second curve is indicated by circles where it does not coincide with the smooth boric acid-sodium hydroxide titration curve. It is the boric acid-sodium hydroxide titration curve when the nickel present is precipitated by potassium ferrocyanide

3 of Fig. 2 shows that no advantage has been gained.

Since nickel forms an insoluble ferrocyanide, potassium ferrocyanide was tried as a precipitating agent to remove the nickel. A synthetic nickel bath containing 330 g $NiSO_4.6H_2O$ and 50 g $NiCl_2.6H_2O$ per liter was used. One ml of this solution was used with 5 ml of saturated potassium ferrocyanide solution, 20 ml of 0.1 N H_3BO_3 and 10 ml of 1.75 M mannitol solution. Titration of this mixture with standard alkali was followed with a *p*H meter. The results are presented by the curve of Fig. 3. The smooth curve is the pure boric acid curve while the curve whose course is traced by the circles represents the nickel ferrocyanide-boric acid curve. It is apparent from Fig. 3 that the ferrocyanide removes the nickel so that it does not interfere in the titration of the boric acid and that the nickel ferrocyanide-boric acid curve resembles the boric acid titration curve.

Effect of Impurities

In order to test the effect of impurities on this titration Co^{++}, Fe^{+++}, Zn^{++} and Mg^{++} were added separately to the system and each titrated with phenolphthalein as indicator. One gram each of the salts of these ions was dissolved in 100 ml of water and 10 ml of the aqueous solution were added to one ml of the synthetic nickel bath. The titration took place readily with the indicator changing as before. The results are given by Fig. 4, curve 2, the course of which is traced

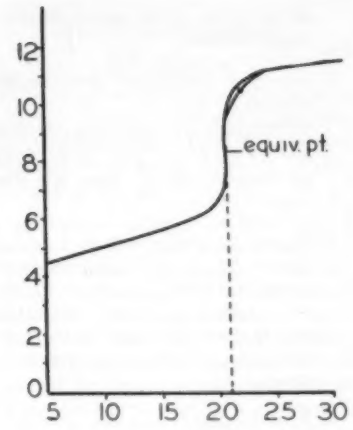


Fig. 4. Smooth curve is boric acid-sodium hydroxide titration curve when nickel is absent

Second curve is indicated by circles where it does not coincide with the smooth boric acid-sodium hydroxide titration curve. It is the boric acid-sodium hydroxide titration curve when the nickel present is precipitated by potassium ferrocyanide and metal ions are present as impurities

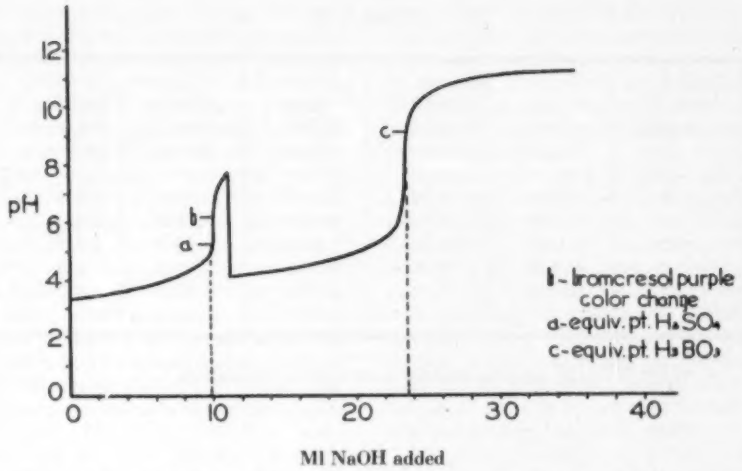


Fig. 5. Boric acid-sodium hydroxide titration curve with nickel and mineral acid present. The sharp drop in the pH is caused by the addition of the mannitol

by the circles. This curve follows closely the curve of the pure boric acid titration.

It was now established that the boric acid content of a synthetic type nickel plating bath could be determined accurately when using phenolphthalein as an indicator. A series of ten determinations was made with this new method involving the addition of potassium ferrocyanide with phenolphthalein as the indicator. The percentage deviation of these determinations, 0.32 per cent, as compared with the percentage deviation of the standard method, 1.05 per cent indicates the greater precision of the new method.

Mineral Acid Present

Frequently it is found necessary to add mineral acid for the purpose of adjusting the *p*H of the nickel bath to a desired value. When this is done it is necessary to determine the boric acid content of the bath in the presence of mineral acid. In order to do this the mineral acid should first be titrated using an indicator that will change at a *p*H of 5–6 after which the boric acid is complexed with mannitol and is titrated with phenolphthalein as an indicator.

For this determination a synthetic Watts type nickel bath was prepared by dissolving 33 g $NiSO_4 \cdot 6H_2O$, 4.5 g $NiCl_2 \cdot 6H_2O$ and 3.0052 g H_3BO_3 in distilled water and diluting to 100 ml. A dilute sulfuric acid solution was prepared by diluting one ml of conc. H_2SO_4 (sp. gr. 1.84; 96 per cent) to 100 ml with distilled water.

Two ml of the synthetic nickel bath and two ml of the dilute H_2SO_4 solution were pipetted into an Erlenmeyer flask. Ten ml of saturated potassium ferrocyanide solution, 25 ml H_2O, and 5 drops of bromcresol purple indicator were added. The mixture was titrated with 0.0728 N NaOH with the use of a *p*H meter and the *p*H noted when the mixture became blue in color. Fifteen ml of 1.75 M mannitol solution and 5 drops of phenolphthalein indicator were then added. The titration was continued and the *p*H of the mixture noted when the color changed to a violet-blue. The results of this titration are shown in Fig. 5. Bromcresol purple was picked as the indicator for the mineral acid titration because of the distinct color changes it produces. Other indicators which would change color at or closer to the equivalence point were discarded because their color change can not be observed in the presence of the green precipitate of nickel ferrocyanide.

It is apparent from Fig. 5 that a very small amount of H_3BO_3 will be titrated before the endpoint with bromcresol purple indicator is reached and it would seem that this introduces an error in the boric acid determination. However, this is not the case. When boric acid in a nickel bath is determined by complexing it with mannitol and titrating with standard alkali to the phenolphthalein endpoint the results are always high. This is shown in Table I which is a summary of five determinations of boric acid in a synthetic nickel bath in which the nickel has been precipitated by potassium ferrocyanide and the boric acid is complexed with mannitol.

However, when mineral acid was present in the synthetic nickel bath along with the boric acid the per cent relative error of the boric acid determinations was much less. The boric acid was determined in the following manner. To a two ml sample of the bath was added two ml of dilute H_2SO_4 solution and 25 ml of distilled water. Ten ml of a saturated potassium ferrocyanide solution was added to precipitate the nickel, thereby preventing the hydrolysis of the nickel salts from interfering in the titration.

TABLE I

Sample ml	Grams H_3BO_3 Present	NaOH Used ml*	Grams H_3BO_3 Found	Absolute Error in Grams	Per cent Relative Error
2	0.0602	9.90	0.0612	0.0010	+1.7
2	0.0602	9.97	0.0622	0.0020	+3.2
2	0.0602	9.94	0.0614	0.0012	+1.9
2	0.0602	9.89	0.0611	0.0009	+1.4
2	0.0602	9.94	0.0614	0.0012	+1.9

*0.100 N NaOH solution used for boric acid determination.

TABLE II

Sample ml	Grams H_3BO_3 Present	NaOH Used ml*	Grams H_3BO_3 Found	Absolute Error in Grams	Per cent Relative Error
2	0.0602	9.83	0.0607	0.0005	+0.8
2	0.0602	9.79	0.0605	0.0003	+0.5
2	0.0602	9.76	0.0603	0.0001	+0.2
2	0.0602	9.79	0.0610	0.0008	+1.0
2	0.0602	9.72	0.0601	0.0001	+0.2

*0.100 N NaOH solution used for boric acid determination.

TABLE III

Sample ml	Grams H_3BO_3 Present	NaOH Required			Grams H_3BO_3 Found	Per cent Relative Error
		A*	B†	B–A		
2	0.0602	0.20	9.97	9.77	0.0604	+0.3
2	0.0602	0.18	9.86	9.68	0.0598	−0.6
2	0.0602	0.18	9.94	9.76	0.0603	+0.2
2	0.0602	0.18	9.90	9.72	0.0601	−0.2
2	0.0602	0.18	9.94	9.76	0.0603	+0.2

*Ml of 0.100 N NaOH required to reach bromocresol purple endpoint.
†Ml of 0.100 N NaOH required to reach phenolphthalein endpoint after the addition of mannitol solution.

After the addition of five drops of bromcresol purple indicator the solution was titrated with standard alkali until the blue endpoint was reached. The first reading of the burette was recorded. To the solution was then added 15 ml of 1.75 M mannitol solution and five drops of phenolphthalein indicator solution. The titration was continued until the color changed from green through blue to violet-blue. The burette was then read for the second time and recorded. The difference between the first and second readings of the burette was the amount of alkali necessary for the titration of the boric acid in the nickel bath.

Table II shows the results of five such determinations.

From Fig. 5 it is apparent that some alkali was used in titrating a small quantity of the boric acid in the bath before the bromcresol purple endpoint was reached. Table III shows the volume of standard alkali necessary to reach the bromcresol purple endpoint when no mineral acid is present in the bath. The following determinations were made with the nickel precipitated as the ferrocyanide, mannitol being added only after the bromcresol purple endpoint appeared.

It is apparent from Table III that in order to reach the bromcresol purple endpoint, a very small quantity of H_3BO_3 will be neutralized. However, Table I shows that the results are always high when phenolphthalein alone is used as the indicator. It was therefore decided to include the use of the bromcresol purple indicator for two reasons. (1) It is the only indicator which gives a clear, distinguishable endpoint at the required *p*H in the presence of nickel salts. (2) The unavoidably high results of the phenolphthalein titration for boric acid are in part compensated by the use of this indicator to neutralize the free mineral acid.

As a result of the foregoing research the following procedure is recommended.

Recommended Procedure

Reagents Required

1. Standard sodium hydroxide solution—0.1 N

   Dissolve 50 g NaOH, in 50 ml distilled H_2O. Filter through a Gooch crucible. Dilute 4 ml of the filtered solution to 1 l with freshly boiled, cooled distilled water. Standardize against potassium acid phthalate. Standard sodium hydroxide may also be purchased from many chemical supply houses.

2. Saturated potassium ferrocyanide solution

   To 500 ml of hot, distilled water, add more $K_4Fe(CN)_6.3H_2O$ (c.p.) (approximately 500 g) than will dissolve. Cool.

3. Mannitol solution—1.75 M
   Add 31.8 g mannitol, reagent grade to distilled water and dilute to 100 ml. Since only a portion of the mannitol will dissolve in this volume of water, the solution is used as a slurry.

4. Phenolphthalein indicator solution—0.1 per cent in alcohol.

5. Bromcresol purple indicator solution—0.1 per cent

Apparatus Required

1. Pipette, 2 ml
2. Burette, 50 ml
3. Graduated cylinder, 25 ml
4. Erlenmeyer flasks, 125 ml

Procedure

1. Pipette two ml of the bath to be tested into an Erlenmeyer flask.
2. Add 25 ml distilled H_2O, 10 ml saturated potassium ferrocyanide and 5 drops of bromcresol purple indicator solution to the sample.
3. Titrate with standard sodium hydroxide solution until the greenish precipitate present in the sample turns to a distinct blue color. Record the burette reading.
4. Add 15 ml of the well-shaken mannitol slurry and 5 drops of the phenolphthalein indicator solution. The sample will turn green again upon this addition of the mannitol slurry.
5. Continue the titration with the standard sodium hydroxide until the sample solution turns from green through blue to violet-blue. Record the burette reading.

Calculations

6. Substract the burette reading obtained in Step 3 from that obtained in Step 5. This will give the ml of standard sodium hydroxide required to titrate the boric acid present in the two ml sample.

$$g\ H_3BO_3/l = ml\ of\ NaOH \times Normality\ of\ NaOH \times 30.9$$

Reference

[1]Hollander and Rieman, Ind. Eng. Chem. Anal. Ed. 17, 602-603 (1945).

Washington Orders

Copies of NPA orders and publications may be obtained from National Production Authority, Washington 25, D. C., or from any of its local offices.

Aluminum.—Drought induced power shortages in the Pacific Northwest and Tennessee Valley areas beyond those previously estimated are expected to seriously affect aluminum production. As a result of these power shortages the industry will lose almost 25 per cent of its national primary production or about 40 million pounds of aluminum per month, NPA said. This will probably result in prime producers and fabricators falling about 4 to 6 weeks behind in delivery schedules by January, 1953. However, the recently announced diversion of an additional 77 million pounds of Canadian metal to the United States will help to lessen the impact of the hydro power shortages. Meanwhile, the Defense Production Administration announced an expansion goal of about 35 per cent for aluminum sheet and aluminum sheet and heat treating facilities to be reached in 1955.

Cobalt.—Schedule 2 of NPA order M-80 was amended October 3 to permit the use of cobalt in the production of porcelain enamel signs. This move was made to avert possible serious unemployment in the industry whose specially trained workers cannot readily find employment at their earning levels at other plants. However, cobalt still is in short supply, and with the increase of jet engine production, supplies for civilian use may become even more scarce, according to NPA.

Copper.—An easing of the immediate copper supply situation was brought about by a sharp increase in importations of foreign copper. Allotments of this metal for the first quarter of 1953 will continue at 1952 third and fourth quarter levels—in two parts—60 per cent from domestic sources and 40 per cent from foreign sources. With the recent price adjustments it is expected United States consumers will be in a better position to take up the entire U. S. entitlement of foreign copper, NPA said. An amendment to NPA order M-16 intended to reduce paper work was issued November 20. It permits small foundries to procure up to 10,000 pounds of copper raw materials and 1500 pounds of domestic refined copper without filing form NPAF-83.

Chlorine.—Because for the past six months the supply of chlorine has been adequate to meet the demand, NPA order M-31 covering chlorine delivery provisions and percentage ceilings on marketable production was revoked on November 18.

List of Basic Materials and Alternates.—In list No. 9 dated October 31, selenium compounds (other than those produced from electrolytic copper sludges) and copper chemicals were removed from a group I "in short supply" classification to group III, "in fair to good supply". Shifted from a group II "in approximate balance" classification to group III were hydrogen peroxide, sodium cyanide and artificial graphite electrodes, anodes and special shapes. Removed from the list were the following grades of rubber: pale crepe (grade IX–2), sole crepe, natural dry (other than in group I), latex and reclaimed.

Nickel.—DPA announced on November 14 an increase in the expansion goal for nickel to provide a total annual supply of 190,000 tons in 1955. This revised goal represents an increase within three years of 89,000 tons over the 1950 U. S. available supply. NPA also announced on November 25 that it is considering an amendment to existing orders which would simplify paper work. Officials of the agency said the U. S. is receiving a major share of the free world supply of nickel and can expect only a little more in the first quarter of 1953. Though some new production of nickel is expected some time in 1953, the amount is not known at this time.

Rubber.—NPA order M-2 was amended on October 28 with the intent to ease restrictions on the use of natural crepe and to require the marking of butyl tubes for purposes of scrap differentiation. The agency report dated November 12 showed a decline from the figure reported in a similar nine-month period a year ago of 8.5 per cent in the world production of natural rubber. Consumption of this material on the same comparative basis was down 6.3 per cent.

Selenium.—In a review of the supply situation NPA stated that selenium supplies are short and are expected to become shorter. Present allocations are meeting about 85 per cent of requirements. The situation could become critical if selenium is diverted to the defense stockpile. At the same time DPA announced a U. S. expansion goal for the metal of 1.1 million pounds in 1955, which represents about a 30 per cent increase over the available supply in 1950.

Tin, Zinc.—Two divisions of the NPA were reorganized on October 7. Under the new set-up the Tin, Lead and Zinc Division is combined with the Miscellaneous Metals and Minerals Division. NPA further stated to a committee of the Tin Plate Industry which met on November 6, that tin was coming into the country at a very good rate, but lower production could be expected in the Far East.

The DPA on November 4 announced a revised defense expansion goal for zinc of about 20 per cent for 1956. This is an upward revision of a previous goal announced in January, 1952.

Famous for fine performance
STORTS Perforated ANODES

PERFORATIONS in these anodes are sally ports for current—highly efficient and evenly distributed. Fine performance records have made Storts anodes the favorite in many plants for more than 20 years.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 140.

The 40th Annual A.E.S. CONVENTION

The Benjamin Franklin, Headquarters Hotel

The Benjamin Franklin Hotel was the obvious answer when the 1953 Convention Committee had listed all of the requirements for a Headquarters Hotel. It is centrally located both in regard to business and recreation; it is in the middle of the historical section of Philadelphia; it is large enough to provide all of the meeting space required; it can provide rooms for all; and offers excellent wining and dining facilities.

The Headquarters Hotel is centrally located from practically every point of view. It is in the center of the section which was the birthplace of American political history. The outstanding historical sight, Independence Hall, is within three blocks while at least a dozen other interesting landmarks are within the range of a walking tour.

All of the big stores are within four blocks. This includes Gimbels, Strawbridge and Clothier, and Wanamakers. Wanamakers auditorium will, incidentally, be the site of Monday afternoon's entertainment for the ladies. The Hotel itself is located on Chestnut Street, famed for its shops of every description.

Those interested in night life will find it centering around Locust Street, just two blocks from the Hotel. For the elite, there are the Academy of Music and several legitimate theatres. A program of events around town will be available at the time of the Convention. It is guaranteed that no one need be bored while staying in Philadelphia!

The Hotel itself is a 17-story structure of modern fireproof construction. There are a total of 1200 bedrooms; a sufficient number has been set aside to take care of the anticipated A. E. S. needs. The Benjamin Franklin also owns and operates a 350-car garage, thus assuring those who drive convenient parking service. Of interest to exhibitors is the fact that there are five freight elevators assuring easy handling of heavy materials. Hotel personnel are trained to cooperate with exhibitors and are in a position to help with properties, etc.

Three meeting rooms have been made available for the technical and business meetings to be held during the week. The climax of the Convention, the banquet, will be held in the Crystal Ballroom. This is a most impressive Colonial hall equipped with a modern sound system and excellent lighting and staging facilities.

For dining there is the Garden Terrace, noted for its fine food and excellent floor show. Across one end of the Terrace room is a series of murals, etched in glass, depicting the various contributions Benjamin Franklin made to America and the American way of life. These murals are of strong artistic and historic interest, and the Conventioneers are urged to pay them special note when in Philadelphia.

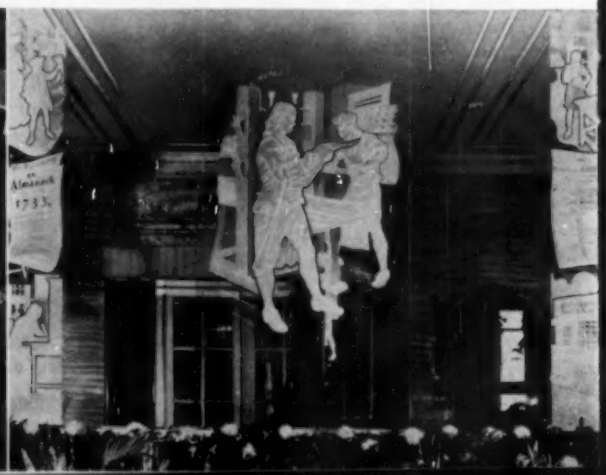
For those preferring a less formal atmosphere there is the Coral Cafe, off the lower lobby. This is a colorful dining room serving excellent food at popular prices.

In discussing meeting rooms we neglected to mention the one which is probably most important. That is the Kite and Key Cocktail Room and Bar. This room is large enough to accommodate all, but of such a mood and atmosphere to make it seem reserved for your group alone.

Several parlor suites have been set aside for use of the supply houses, and a block of double and twin bedrooms for use of the A. E. S. The double bedrooms will be assigned to members bringing their wives while the twin bedrooms will be assigned to members rooming together. This has been covered in a recent letter circulated by Thomas Rodgers, Chairman, Hotel Reservations. It is to be emphasized that all reservations should be made through Mr. Rodgers whose address is 1508 Hampstead Road, Penn Wynne, Pa. This will assure that all members will get rooms in the group set aside for the A. E. S. and will eliminate any hotel mixup. For those insisting on a single room, the committee will make the required arrangements in a nearby hotel. Reservation requests should be in by March 1, 1953.

As a convention hotel, the Benjamin Franklin has everything to offer and its management is cooperating fully with the A. E. S. Convention Committee to assure that the affair will run smoothly. Just another reason why the 40th Convention will be the standard of excellence for years to come.

Benjamin Franklin Hotel; Lobby; one of a series of Murals found in the Garden Terrace depicting printing interests of Benjamin Franklin



UNICHROME
Trade Mark

News about
COATINGS for METALS
Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

Zinc Finish Bright as Chromium

Chromate protection against corrosion

Protecting zinc or cadmium plated steel or zinc die castings is easy, economical and can meet Government specifications when you use one of the Unichrome Dips. Several different ones are available to produce black, yellow, olive drab, or brassy-yellow coatings which give required resistance to salt spray and exposure. This chemical process is adaptable for manual or automatic operation.

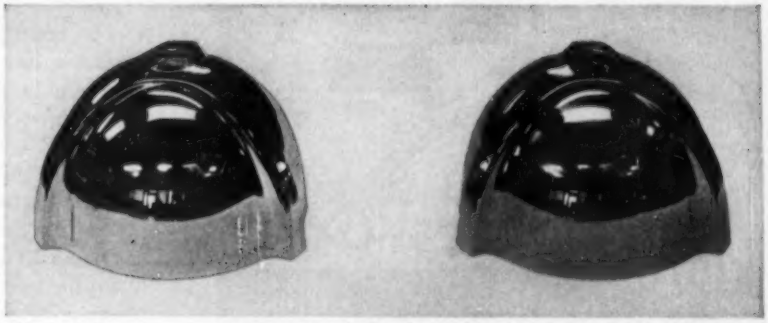
Zinc, too, can be anodized

The Anozinc* process, using conventional plating equipment, produces black, yellow or clear chromate type coatings on zinc plated parts by means of current. It provides a finish with not only the desired corrosion resistance, but also superior toughness while still wet. This means that parts can be handled at once without tying up space for storage and drying. Zinc plated steel shell cases are being turned out at a fast clip with this process, as are propeller blades and other vital work. Write for data.

**Trade Mark*

BIG ADVANTAGE IN HARD CHROMIUM PLATING

Chromium plating of vital parts reduces friction, wear and corrosion. At the same time, it is known to reduce fatigue strength of high strength steel. However, the loss of fatigue strength can be minimized by using a Unichrome S.R.H.S. Chromium Plating Bath. As reported by an independent research laboratory, specimens plated in an ordinary chromium bath showed a 25.7% loss of fatigue strength, whereas those plated in the Unichrome S.R.H.S. CR-110 Bath exhibited only 7.6% loss. *DESIGNERS PLEASE NOTE.*



Unretouched photograph. Casting on left was buffed, zinc plated and treated in Unichrome Clear Dip. Casting on right was buffed and plated with copper, nickel and chromium. They're hard to tell apart.

Successful finishing system used on wide variety of steel and die cast products

● Bright finishes which combine a treated zinc plate with organic coatings are here to stay. No longer can they be classed merely as substitutes. Used through sheer necessity at first, they have established themselves as a *quality* finishing method for a wide line of products.

One of the most outstanding among these combination finishes, as indicated by users' experiences, is the Unichrome Clear Dip Finish. In some cases, it has actually resulted in a higher quality finishing method than the one replaced. In other cases, its economy has permitted use of an eye appealing finish even on low cost items – such as screws, wire goods and small parts of other products.

THREE STEPS TO ACHIEVE THIS FINISH

Zinc plating the product comes first, of course. Usually only .0002″ to .0005″ of zinc suffices. Since zinc by itself doesn't stay bright, step two is chemical treatment of the zinc plate in Unichrome Clear Dip solution. It emerges with chromium-like brightness. With greater resistance to corrosion and better paint holding properties, too. The Unichrome Dip Finish is integral with the zinc. It retains its brilliance and resists conditions which cause zinc to turn dull, finger-mark or develop white rust.

AN UNUSUAL FINISH FROM ALL ANGLES

Users find the brightness of Unichrome Dip unusual. Likewise its economy – with some products being treated for a fraction of a penny's worth of materials per square foot. Operating costs are low, too. The Unichrome Clear Dip Process is fast, easy to control, and adaptable to manual or automatic operations.

Naturally, the better the organic coating which is applied, the better the whole finish becomes. In this also, users have found the unusual – Unichrome Clear Enamels.

HOW GOOD CAN AN ORGANIC COATING BE?

Here's a case to illustrate the exceptional durability that Unichrome Dip Finish gets – or any other bright finish for that matter – when protected with Unichrome Clear Enamels.

Over 70 clear coatings for bright finishes were subjected to year-long Florida exposure tests by a well known company. Most were baking types. Unichrome Coating A-140 was one of the few air-drying coatings. It was applied in a thickness of 0.4 mil as against 0.8 for the others. Despite this, it was the coating that stood up best by far in the entire test group, being good as new at the end of the test.

Unichrome Clear Enamels like this make it possible to increase the corrosion resistance of bright metal finishes.

Write to United Chromium for more information on coatings for metals. Detailed bulletins available.

UNITED CHROMIUM, INCORPORATED

100 East 42nd Street, New York 17, N. Y. • Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif. • In Canada: United Chromium Limited, Toronto, Ont.

SAFETY EQUIPMENT FOR ALL INDUSTRIES

Write For Literature

IPCO Safety Equipment for all Industries

INDUSTRIAL PRODUCTS COMPANY

2824 N. FOURTH STREET • PHILADELPHIA 33, PA.

USE READER SERVICE CARD; INDICATE A 142.

Glo-QUARTZ

ELECTRIC IMMERSION HEATERS

Your "Q" to better acid heating . . .

GLO-QUARTZ immersion heaters offer a new way for heating acid electroplating and pickling solutions; it is the latest advancement in the scientific application of far infra-red radiation to the heating of all acid solutions at all temperatures and concentrations.

OUTSTANDING DESIGN FEATURES—

- Smooth surfaced-transcluent fused Quartz sheath—completely acid proof
- Renewable heating elements—installed without removing heater from tank
- **Only fused Quartz heater manufactured** with genuine, standard, explosion-proof, vapor-proof junction box
- **Only fused Quartz heater manufactured** with fuses inside junction box for maximum protection of personnel and equipment
- Minimum immersible length permanently indicated on each heater
- Special heat resistant, corrosion resistant plastic coating on heater guard and junction box
- Adapatable to automatic temperature controls

Available from stock for immediate shipment in 115, 230 and 460 volts; single or three phase; from 1500 to 12,000 watts.

Write for new 4-page bulletin TL-52 containing heater data & list prices.

* Trademark

Glo-QUARTZ ELECTRIC HEATER CO., INC.

Mfgrs. of Fused Quartz Electrical Heating Elements

37934 Elm St., Willoughby, Ohio

QUESTION BOX

readers' questions of general interest

Q. 148. Our company is planning an installation of a line of equipment for the bright dipping of an assembly of aluminum and brass, the aluminum finish being a major consideration. Is there any preferred treatment cycle for such an item?

A. The conventional nitric-phosphoric bright dip for aluminum has been found to be satisfactory, yielding a bright aluminum finish with not too severe an etched brass surface. However, immersion deposits of copper have been found to occur in the rinse after the aluminum bright dip with a resultant finish on the aluminum from a dark smut to a copper color. A follow up dip in a regular brass bright dip or a simple nitric solution was found to remove the copper film. The design of a layout for your assembly will depend upon the amount of copper in your first rinse.—A. KORBELAK.

Q. 149. In the construction of replaceable rack contacts stainless steel is a desirable material because of the ease of stripping at the end of a shift. 18-8 stainless is not springy enough. What stainless alloys have good spring properties?

A. SAE 420 has good corrosion resistance, has desirable properties of hardness and springiness. SAE 440B though generally used for gages and instruments also may be of value because of good spring properties.—H. J. EHRINGER.

Q. 150. We have recently had to use British aluminum stock and find our nitric-phosphoric acid bright dip yields a less bright and uniform finish than we had been getting on American aluminum. Any information you can give us on the bright dipping of British aluminum will be appreciated.

A. Assuming you control your bright dip carefully (you must, you know) there are two reasons why this occurs:

1. The stock may contain greater amounts of impurities, Cu, Si and possibly traces of Fe.
2. The type of finishing operation may be different and consequently the physical structure may be such as not to bright dip well.

First, check your bright dip against aluminum stock you know to be good. If the bright dip itself is satisfactory it is suggested that very little can be done except to (a) specify to your supplier the type of aluminum you want, or (b) determine whether any proprietary bright dip bath may be sufficiently better to justify its use.—ANON.

Sel-Rex®

Completely Sealed Rectifier Equipment is the only answer to maintenance and trouble-free Plating Power

Do your motor-generator sets and "budget-priced" rectifiers require costly maintenance? Do they break down at the darnest times? You do not have to suffer these conditions when you buy SEL-REX COMPLETELY SEALED RECTIFIERS . . . REACTRONICALLY CONTROLLED. SEL-REX equipment can be operated 24 hours a day, year-in-year-out, at full load . . . never needs cleaning, can't corrode. And Sel-Rex Rectifiers supply AUTOMATIC VOLTAGE and/or CURRENT instantly.

NEMA

BART-MESSING CORPORATION

Dept. PL-1 • 229 Main Street • Belleville 9, N. J.

The World's Finest Power Equipment

Savings on maintenance and continuous, uninterrupted service pays for Sel-Rex equipment in fast time.

Send for "Plating Power" book at once. It shows you how!

INDICATE A 144.

FOR BETTER COPPER PLATING

DAYBRITE

ACID COPPER PROCESS

Let DAYBRITE solve your COPPER PLATING problems. Check these important, money-saving features:

- ✓ Low Conversion and Operating Costs
- ✓ High Plating Speed
- ✓ High Degree Of Leveling
- ✓ Smooth, Lustrous Deposits
- ✓ Ideal As Undercoat For Chromium After Color Buff or Brite Dip.

DAYBRITE is time tested and proven. Write now for technical bulletin giving full details.

DAYTON BRIGHT COPPER CO.

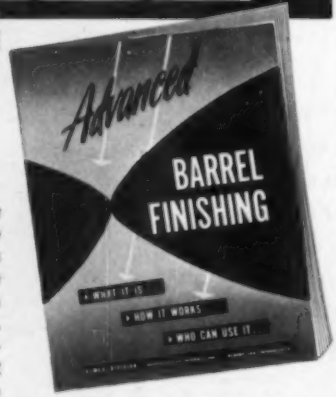
1030 Valley St. Dayton 4, Ohio

USE READER SERVICE CARD; INDICATE A 145.

FREE

IF YOU PRODUCE PARTS THAT REQUIRE FINISHING OF ANY KIND

This amazing 22-page booklet is *guaranteed* to open your eyes! Gives latest, up-to-the-minute facts – figures – photos on advanced barrel finishing. Shows how single unit installation replaces from 2 to 12 men—*savings up to 95%* on almost all types of parts from large castings to small intricate parts.



Investigate today! Send for your FREE copy of Booklet No. C-1 today.

ALMCO Supersheen

AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL FINISHING EQUIPMENT – MATERIALS AND COMPOUNDS

ALBERT LEA, MINNESOTA

USE READER SERVICE CARD; INDICATE A 146.

Article Abstracts

No copies of articles are available at the offices of "Plating". Photostats may be had from libraries having files of the journal in question and offering photostat service, usually at 30-50 cents a page. Ask your public library to consult the Union List for names of libraries having the particular journal. Abbreviations used are those of Chemical Abstracts.

The Corrosion Resistance of Electrodeposited Tin-Nickel Alloy. S. C. Britton and R. M. Angles. J. Electrodepos. Tech. Soc. **27**, 293–322, 1951.

"Electrodeposition of tin-nickel alloys from a mixed chloride-fluoride bath has been described by Parkinson (J. Electrodepos. Tech. Soc. **27**, 1951) with an indication that deposits with about 65 per cent tin are hard, bright, pleasant in appearance and tarnish-resistant". This paper now studies the corrosion resistance of this alloy. It is cathodic to steel and brass, and is unaffected by neutral and alkali solutions or by acid solutions having a *p*H over about 1.2. Some testing was done by immersing a .003 inch thick plate, over brass, in many different solutions. It is very resistant to tarnishing and is regarded as much better than either tin or nickel. Other tests, including outside exposure and several different types of accelerated corrosion tests, were run on steel and brass plated with different thicknesses of this alloy. A .0005 inch coating is recommended, direct on brass, and with a .0005 inch undercoating of copper for steel. Tables and photographs are presented, and a discussion follows.—*L. B. Sperry.*

Hard-Chromium Plating of Aluminum. L. N. J. Welschen. Dutch Patent 68,519 (Aug. 15, 1951). Al. Labs. Abst. Bull. **23**, p. 501 (Sept. 1952).

Aluminum can be chromium plated without an intermediate layer by preheating the metal, so that a good adhesion of the chromium layer is warranted. After removal of grease the aluminum surface is successively and if desired, alternately, treated with two different acid pickling liquors, namely at first with a solution

GOD HELPS THEM

who help themselves. You can help yourself a great deal when it comes to plating matters by enrolling in ELECTRO-PLATING KNOW HOW, the unique home study course that helps you reduce waste and increase profits. Enroll and help yourself to this profit builder, today!

Joseph B. Kushner
Electroplating School,
Stroudsburg 11P, Penna.

USE READER SERVICE CARD; INDICATE A 147.

(I) of H_2SiF_6 in H_2O, and then with a solution (II) of CrO_3 in H_2O. and if necessary, with another strong acid, such as chloric acid and then again with I. Finally the surface is neutralized by an alkaline substance. In an example, I consists of 200 cubic centimeters H_2SiF_6 in 1000 cubic centimeters H_2O and II consists of 30 grams CrO_3 in 100 cubic centimeters strong chloric acid and 1000 cubic centimeters H_2O. The aluminum surface is degreased, for example, with ground chalk. The object is immersed in I, heated at 30° C for one minute, washed with H_2O, immersed in II, heated at 30° C for one minute and washed again. These treatments may be repeated and, after a final treatment with I, may be followed by washing with H_2O, neutralizing with powdered chalk, abraded with pumice powder, and washed again. Then the surface is hard-chromium plated.

Protection of Optical Glasses and Aluminized Mirrors. Flamant. Centre National de la Recherche Scientifique, "Les Propriétés Optiques des Lames Minces Solides", pp. 76–80 (1950). Metals Rev. 25, p. 26 (Sept. 1952).

Behavior of films used for increasing or decreasing the reflectivity of glass, and of films likely to be used for protection of metallic deposits, when they are exposed to an atmosphere containing sea air, at 35° C, during a time sufficient to cause deterioration. The fluorides used either as protecting films or for anti-reflection treatment had poor resistance. Silicon and SiO are practically unalterable when deposited on glass. They give the best protection for reflecting surfaces of metallic aluminum. But this protection disappears because of cracking. TiO_2 and Al_2O_3 films are also discussed.

Cathode Polarization Potential During Electrodeposition of Copper. III. L. L. Shreir and J. W. Smith. Presented at the Electrochemical Society Fall Meeting, 1952.

The variation of the cathode polarization with time during electrolysis at various current densities, and with cathode bases of different structures was studied.

PRICED TO SELL !

MOTOR GENERATORS

Reliably Rebuilt 1 Year Guarantee

6/12 V.

1—10,000 A. HVW 2½/10 V.
1—10,000 A. J-L 2½/10 V.
1— 7500 A. North. 2½/10 V.
1— 5000 A. HVW 6/12 V.
1— 2500 A. Chandey. 6/12 V.
1— 1500 A. HVW 6/12 V.
1— 800 A. HVW 6/12 V.
1— 600 A. Eager 6/12 V.
1— 500 A. Chandey. 12 V.
1— 300 A. Hobart 6 V.
1— 200 A. Boissier 6 V.
1— 200 A. U. S. 12 V.
1— 150 A. HVW 6 V.
3— 125 A. Hobart 6 V.
1— 120 A. Eager 7½/15 V.
1— 100 A. HVW 6 V.

15 to 28 V.

1—1000 A. G. E. 15 V.
4— 25 A. Diehl 25 V.
2— 100 A. G. E. 28 V.
1— 200 A. West. 28 V.
1— 500 A. G. E. 28 V.
1— 800 A. G. E. 28 V.
1—1500 A. Cent. 28 V.
1—2500 A. Cent. 28 V.

30 to 30 V.

1— 100 A. G. E. 32 V.
1— 200 A. West. 32 V.
1—1000 A. Cent. 32 V.
1—1000 A. Chandey. 40 V.
1—1250 A. Cent. 45 V.
1— 75 A. G. E. 50 V.
1— 325 A. West. 50 V.
1—1500 A. G. E. 50 V.
1—1000 A. G. E. 60 V.
1—1000 A. G. E. 75 V.

L. J. LAND, Incorporated

136 Grand Street, New York 13, N. Y. CAnal 6-6976

Established 1910

HOW IS YOUR METAL-WASHING MACHINE WORKING?
DO THE NOZZLES CLOG TOO OFTEN?
IS THERE TOO MUCH FOAMING?
EVERYTHING IS OK! WE ARE GETTING OAKITE SERVICE

Is your washing machine removing buffing compounds as thoroughly as it removes cutting oil and metal chips?

Is it cleaning brass, aluminum and zinc die castings as well as it cleans steel?

Oakite chemists and service engineers have developed cleaning materials that meet every requirement for washing metal by machine. Oakite Technical Service Representatives know how to make these materials work at top efficiency in all types of machines.

Years of Oakite experience are compressed into a 16-page booklet called "*8 things to look for when you wash metal by machine*". You'll want to read the notes on:

- ¶ How to select the best detergent for each job. *See pages 4 to 6.*
- ¶ When to use a solvent detergent. *See page 7.*
- ¶ When to use an alkaline detergent. *See page 8.*
- ¶ How to prepare metal for painting. *See page 9.*
- ¶ Tips on selection and operation of washing machines. *See pages 10 to 12.*
- ¶ Special instrument aids to better operation. *See page 13.*

FREE For a copy of "*8 things to look for when you wash metal by machine*," write to Oakite Products, Inc., 40 Rector St., New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS · METHODS · SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

Simplify your bright zinc plating with

McKeon's
Zinc-Brite

as a constant cleanser and purifier

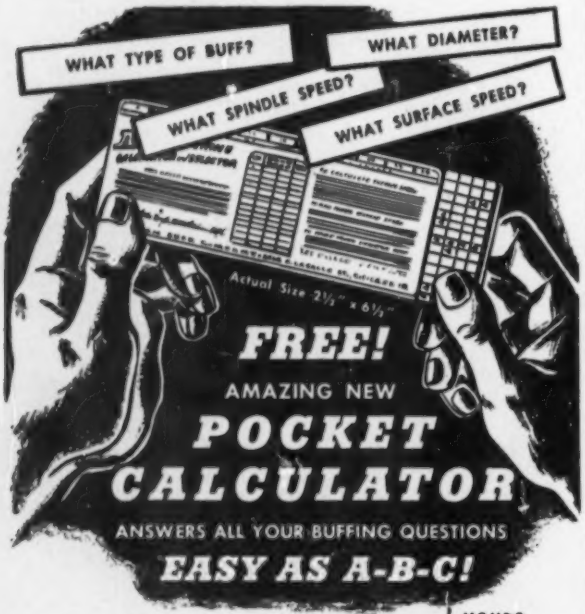
It will:

1. Precipitate heavy metal impurities.
2. Co-precipitate copper impurities, eliminating need for zinc dust treatment.
3. Minimize need for decanting or filtering.
4. Precipitate excessive carbonates.
5. Reduce brightener consumption.

Try a 5-gallon can, $15.00; or a 15-gallon drum, $42.75, FOB Greensburg, on 30 days' approval.

Sulphur Products Co. Inc.
Greensburg Pa. 8

USE READER SERVICE CARD; INDICATE A 150.



WANT TO KNOW the right buff — the right size, the right speed — for every buffing job? No need to guess or figure — just slip the pointer along this handy pocket slide rule and read your answer in a jiffy! Ideal buffing guide for shop foremen or plant superintendents. Compact, handy, durable — fits in coat or shirt pocket.

DEPT. P

American Buff Company

2414 S. LA SALLE STREET • CHICAGO 16, ILLINOIS

"For the Job that's Tough, Use an American Buff"

YOURS... ABSOLUTELY FREE! WRITE TODAY ON COMPANY LETTERHEAD

The effects of cold-rolled and annealed foil cathodes, showing preferred orientation and random orientation, respectively, were compared, and measurements were also made using electrodeposited "constant state polarization" bases produced under standard conditions, and electrodeposited bases of coarse and fine structure. The results support the view of Blum and Rawdon that the cathode polarization is related to crystal size and a change from a coarse to a fine structure is accompanied by an increase in polarization potential.

The Mechanism of Surface Leveling by Periodic Reverse Current Cyanide Copper Plating. Dennis R. Turner. Presented at the Electrochemical Society Fall Meeting, 1952.

Surface leveling obtained with periodic reverse current cyanide copper plating was attributed to the rectifying properties of a stoichiometric cuprous oxide barrier layer formed during the anodic part of the cycle. Anodic dissolution occurs by means of cuprous ions diffusing through breakdowns in the barrier layer. Breakdowns are more frequent at projected surface areas. The greater rate of anode dissolution at these points produces a leveling action.

The Mechanism of Electropolishing of Copper in Phosphoric Acid Solutions. (3 papers) J. Edwards. Presented at the Electrochemical Society Fall Meeting, 1952.

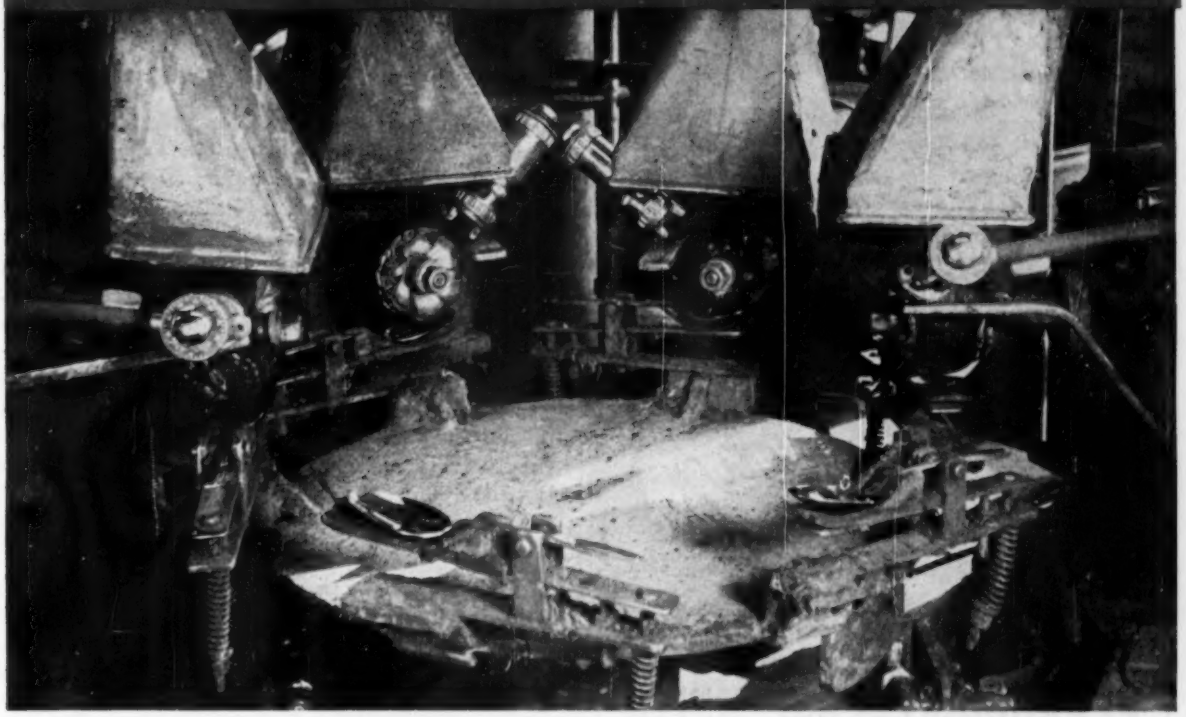
A preliminary investigation was described of the current-voltage-time relationships recorded by a cathode-ray oscillograph mainly for copper in phosphoric acid solutions. The curves show that a sharp fall in current and rise in voltage occurs when polishing conditions are established and that limiting current conditions exist in the polishing range.

An equation by Elmore relating the time required to establish polishing conditions to the current applied was tested with a copper anode in phosphoric acid. The dependence of a constant in Elmore's equation on anode area, phosphoric acid concentration, copper solubility, viscosity, and copper concentration has been investigated. The results show that the process is diffusion-controlled but that Elmore's hypothesis that the onset of polishing coincides with the attainment of the solubility limit of copper in the electrolyte is incorrect. Two possible explanations of these results were advanced based on the view that the controlling process is depletion of the anode layer with respect to either hydrogen ions or to those ions or molecules with which the copper ions are combined in the solution.

Experiments with a composite anode having projections and recesses on its surface insulated from each other showed that the current distribution between projections and recesses underwent very little change when the total current fell and polishing conditions were established. This called for a radical revision of previous views of electropolishing and prompted a

USE READER SERVICE CARD; INDICATE A 151.

Lea Liquabrade



*what it is! *what it does!

LEA LIQUABRADE, recently perfected, is Lea's answer to industry's demand for a clean-washing, fast-cutting *liquid* buffing compound comparable in all respects to the bar form compound with the added advantages noted below. It is a worthy teammate of the well known Lea Compound and Learok, industry's standards for many years. It is already widely used on radial or straight line full automatic buffing machines.

With LEA LIQUABRADE, you are able to shift from the application of bar compound with its repetitive reheading of the wheel to what is in effect continuous operation. You save in composition and in buff wear. Operations are clean and safe. LIQUABRADE is neither inflammable nor explosive.

LIQUABRADE is available with a wide variety of abrasive types and grain sizes. It is available in 5 gallon containers, 55 gallon drums, and in tank car lots. Write us for details. Better yet, tell us about your present buffing procedure. We'll be glad to outline what LEA LIQUABRADE can do to help in improving your present practice.

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

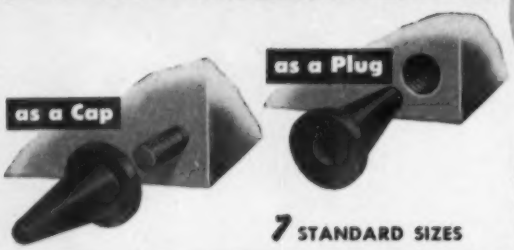
LEA

THE LEA MANUFACTURING CO.
16 Cherry Avenue, Waterbury 20, Conn.
LEA MFG. COMPANY OF CANADA, LTD.
370 Victoria Street, Toronto 2, Canada

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 152.

For Metal Finishers!

Pressure Moulded NEOPRENE **"CAPLUGS"**



7 STANDARD SIZES

	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

MASKING PROBLEMS OUR SPECIALTY!

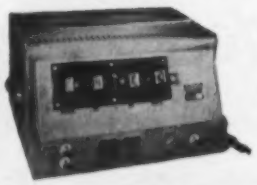
WRITE FOR **FREE** SAMPLE KIT...

DUGGAN Masking Devices

2030 WEST FORT STREET
DETROIT 16, MICHIGAN

USE READER SERVICE CARD; INDICATE A 153.

PERIODIC-REVERSE UNITS



Of the Finest Quality for

PLATING

In the Modern Way

Write for Information

UNIT PROCESS ASSEMBLIES, Inc.

75 East 4th St. New York 3, N. Y.

USE READER SERVICE CARD; INDICATE A 154.

CHEMSTEEL CONSTRUCTION COMPANY, INC.

301 Chemsteel Building, Walnut Street, Pittsburgh 32, Pa.

(No "tie-in" with any manufacturer)

Send data on your Design, Engineering, Material, Construction and Maintenance Facilities for

ACID-ALKALI-PROOF CONSTRUCTION

backed by experience serving major steel, chemical, textile and food industries in erection of

PICKLING, PROCESSING & STORAGE TANKS & FLOORING

NAME.....

COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

(TEAR OUT AND MAIL)

USE READER SERVICE CARD; INDICATE A 155.

Article Abstracts

quantitative investigation of the smoothing efficiency under different conditions on a surface of standard roughness. The conclusion reached was that the mode of smoothing in electrolytic (and chemical) polishing is not specific to these processes but results solely from the variations in concentration gradient within the diffusion layer set up on the anode surface.

Electronic Configuration in Electrodeposition from Aqueous Solutions. I. The Effect of Ionic Structure. Ernest H. Lyons, Jr. Presented at the Electrochemical Society Fall Meeting, 1952.

In aqueous solutions, electrodeposition occurs from ions represented by electronic configurations having hybridized orbitals from the outer electron shell. When the hybridization involves orbitals of the two outer shells, hydrogen rather than the metal is discharged. By comparison with rate studies and mechanisms of the substitution reactions of complexions, it is inferred that the critical step in electrodeposition is the dissociation of one of the coordinated groups from the metal ion. The theory was discussed in relation to various phases of electrodeposition.

Electrogalvanizing from Fluoborate Solutions. T. R. Anantharaman and J. Balachandra. Presented at the Electrochemical Society Fall Meeting, 1952.

The optimum conditions for electroplating zinc from its fluoborate solution were described. The best deposits of zinc are obtained from a bath containing 180 g/l of zinc fluoborate, 30 g/l of ammonium fluoborate, 25 g/l of boric acid, and 1.0 g/l of β-naphthol at a *p*H of 5.0 to 5.4 and temperatures of 20°–30° C, and at current densities of 40 to 90 amp/ft² (4.3 to 9.7 amp/dm²).

Cathodic Lead Disintegration and Hydride Formation. Hugh W. Salzberg. Presented at the Electrochemical Society Fall Meeting, 1952.

Lead cathodes disintegrate into colloidal lead at high current densities in alkaline and weakly acid solutions. It is concluded that the cause of this phenomenon is the formation and subsequent decomposition of a volatile unstable hydride of lead. The formula of this hydride is PbH_2.

The Complete Electrodeposition of Radioruthenium. J. C. Griess, Jr. Presented at the Electrochemical Society Fall Meeting, 1952.

A study was made to determine the conditions necessary for the complete (>99 %) electrodeposition of radioruthenium. Bright adherent deposits usable as radioactive sources for radiation therapy were obtained from acid solutions containing moderately low concentrations (5×10^{-4}M) of ruthenium nitroso salts.

Patent Abstracts

GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,613,179, October 7, 1952—Silver Plating—Henry Wolfson and Bernard Thomson, London, England, assignor to International Standard Electric Corporation, New York, N. Y.

CLAIM 1. An argentocyanide electrolyte for use in electrodepositing bright silver plate at high current densities of at least 10 amp/ft² of cathode area that consists essentially of an aqueous solution of the following substances in substantially the proportions indicated:

	g/l
Silver cyanide	40
Potassium cyanide	55
Potassium nitrate	100
Potassium selenite	1.0

CLAIM 2. . . .

Potassium nitrate	150

CLAIM 3. . . .

Potassium nitrate	100–150
Alkali metal selenite	0.5–1.5

8 claims.

References cited: U. S. Patents 2,440,672; 2,449,726 Egeberg et al; Transactions Electrochemical Society, Vol. 74 (1938), pp. 211–227. Modern Electroplating, pp. 290-291. Metallwirtschaft, Vol. 22 (1943), pp. 472–474 article by Weiner. Ser. No. 351,241 Weiner (A. P. C.), May 18, 1943.

No. 2,614,975, October 21, 1952—Electroplating of Zinc and Electrolyte Therefor—Allan E. Chester, assignor Poor & Company.

CLAIM 1. An aqueous acid zinc sulfate plating bath comprising an acid zinc sulfate electrolyte and a reaction product of thiourea, zinc oxide and gluconic acid.

CLAIM 2. . . . and a reaction product of thiourea, zinc oxide and gluconic acid.

CLAIM 3. . . . a reaction product of thiourea, zinc oxide and aldonic acid in proportions of about 1 to 3 ounces per gallon of plating bath.

CLAIM 4. . . . and gluconic acid in proportion of about 1 to 3 ounces per gallon of plating bath.

9 claims, 2 examples.

References cited: U. S. Patents 1,903,860; 2,537,032.

No. 2,615,836, October 28, 1952—Method of Bonding Vitreous Enamels—Allan E. Chester, assignor to Poor & Company.

This invention relates to a method of bonding vitreous enamels to steel, cast iron and similar materials.

EXAMPLE I.

Look to Miller for MATERIALS and METHODS on all Finishing Applications

- POLISHING — Standard and Master Polishing Wheels in all sizes and materials, custom made for your work.
- BUFFING — Top notch "job tailored" buffs in a complete range of types and grades.
- DEBURRING — The latest in methods and equipment for rapid, economical deburring on all types of work.
- BELT FINISHING — A complete range of belts and backstands with modern methods and equipment for defense or civilian production.

THIS IS MILLER SERVICE

LABORATORIES
Modern analytical and research laboratories working constantly on product control and development.

PRACTICAL ENGINEERS
Technical men with practical experience who are anxious to work with you.

MODERN FACTORIES
Modern and thoroughly equipped for economical production.

SPACIOUS WAREHOUSES
Conveniently located for prompt shipment of materials.

Call in a Miller Finishing Engineer

J. C. MILLER COMPANY
631 Chestnut Street, S. W. • GRAND RAPIDS, MICHIGAN
ARE YOU USING LIQUIMATIC?

USE READER SERVICE CARD; INDICATE A 156.

In 1 gallon of commercial 18° Bé hydrochloric acid there were dissolved:

6 ounces of antimony trioxide (Sb_2O_3)
2 ounces of arsenic trioxide (As_2O_3)
½ ounce of metallic selenium and
1/10 per cent based on total weight of the mixture of lauryl sulfate

The resultant mixture is an acid electrolyte of plating bath suitable for the deposition of antimony on steel or other conducting surfaces in accordance with the invention, thereby to produce a ground coat to which the vitreous enamel is applied. The article preferably made of a conventional type steel is immersed in the foregoing electrolyte as the cathode and is subjected to a superimposed asymmetric alternating current obtained by an electrical hook-up of the type described with reference to Fig. 1. The electroplating operation is preferably affected by superimposing a voltage of 3.2 a.c. (RMS) on 2.5 volts d.c. with a current density of 10 amp/ft² for 8 to 15 seconds, or sufficient to produce a deposit on the order of 2 mgs. per square foot.

The resultant product is then removed from the plating bath and treated with a vitreous enamel milled slip of the following compositions:

	Parts by weight
Frit	100
Clay	7
Silica	2
Sodium nitrate	0.125
Opacifier (optional)	6
Water	42

A typical frit formula which can be used has the following composition:

	Parts by weight
Borax	31.8
Feldspar	29.5
Silica	20.1
Fluospar	4.1
Soda ash	9.0
Sodium nitrate	5.5

This material is blended, smelted, and fritted in the usual way.

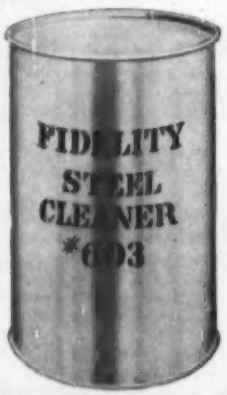
The complete coating formula is milled to the screen fineness of 0 to 25 per cent residue on a 200-mesh screen, usually to 4 to 9 per cent residue, and is then sprayed, slushed or dipped on the previously prepared ferrous metal surface to the desired weight or thickness, usually 1 to 2 ounces per square foot of metal.

After drying this coated metal article, the same is fired to the maturing temperature of the glass, which is preferably within the range of 1320 to 1440° F.

The invention is hereby claimed as follows:

A method of preparing vitreous enamel coated articles which consists essentially of electrodepositing on a ferrous metal article to be enameled a substantially

Fidelity ENGINEERED COMPOUNDS for METAL FINISHING & PLATING



FIDELITY STEEL CLEANER No. 603

Unsurpassed for Steel and Ferrous Metals and Magnesium Alloys

FIDELITY STEEL CLEANER #603 is a top-quality cleaner that does a superior cleaning job with efficiency and economy . . . on steel and ferrous metals, and magnesium alloys. A free-flowing, white powder, it may be used as a reverse, direct or immersion cleaner.

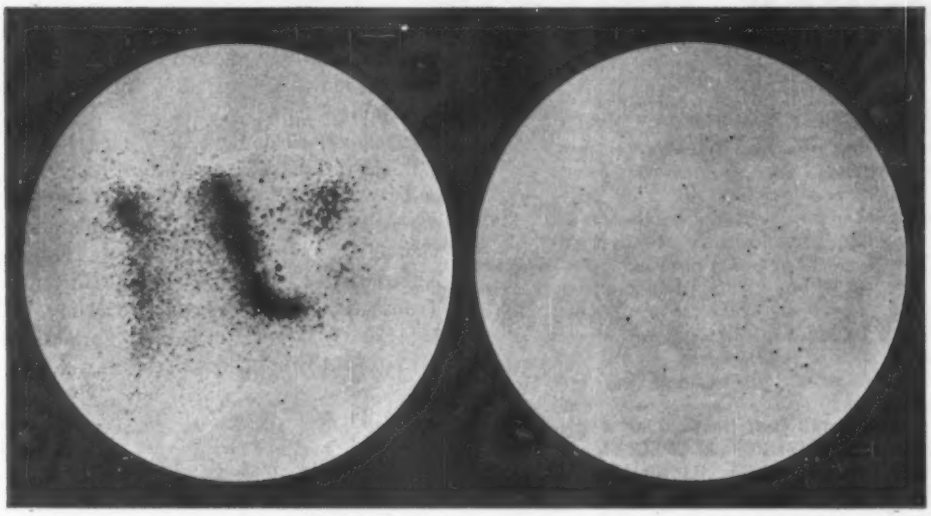
Write, detailing your metal cleaning problems. Our Laboratory Staff will be glad to make recommendations . . . no obligation, of course!

SPECIALISTS IN METAL CLEANERS AND PAINT STRIPPERS
FIDELITY CHEMICAL PRODUCTS CORP.
477 Frelinghuysen Avenue, Newark 5, New Jersey

HOW TO MINIMIZE HEALTH HAZARDS
In Chrome Plating!

Recent medical investigation has indicated that the harmful effects of chrome fumes may extend to vital organs of the human body and not simply to attack of the nasal septum. The insidious result is that the effects may be cumulative over a long period of time, and continued exposure may be extremely serious.

Fortunately, there is a soluble addition agent, NO-CRO-MIST® which when used in conjunction with requisite ventilation, is effective in keeping the chrome fumes below the known harmful concentration in the atmosphere. NO-CRO-MIST has been available for more than five years and is used in many thousands of gallons of chrome baths with amazing efficiency.



Normal Chrome Mist

NO-CRO-MIST® Bath
(No Chromic Acid Mist)

The above unretouched photograph of the Paper Test of Mist from Chrome Baths was first published in October, 1947. It illustrates the remarkable effectiveness of NO-CRO-MIST in reducing chrome spray before the present, even more effective NO-CRO-MIST was developed.

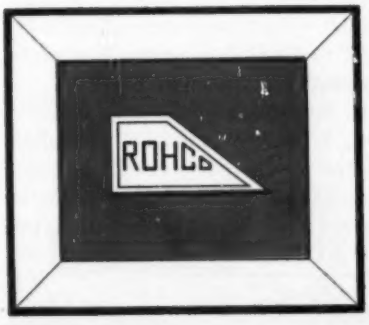
NO-CRO-MIST is not expensive to use because it saves chromic acid and reduces maintenance costs, but any product cost is insignificant when it results in improved working and health conditions.

R. O. HULL & COMPANY, INC.

1302 Parsons Court • Rocky River 16, Ohio

Canada: Armalite Company, Ltd., Toronto 6, Canada

OTHER ROHCO PRODUCTS: ROHCO 100 BARREL ZINC BRIGHTENER • ROHCO 303 STILL ZINC BRIGHTENER • ZINC PURIFIER • ROHCO 20XL CADMIUM BRIGHTENER • RINS-AID • AIRCRAFT BLACK CADMIUM DIP • HULL CELL TEST SETS AND RECTIFIER UNITS • HANGING HULL CELL • CURRENTESTER • FORCITE ANODE BASKET • ADDITION AGENT PUMP



TRY IT YOURSELF! • JUST PIN THIS COUPON TO YOUR LETTERHEAD!

R. O. HULL & COMPANY, INC.
1302 Parsons Court
Rocky River 16, Ohio

Please send copy of the Summary On Chromium Intoxication and complete information on **NO-CRO-MIST®**

Name..... Title.....
Company.....
Street Address.....
City..... Zone..... State.....

NARACO Insures

Special Delivery

Each bomb part finished on a NARACO rack INSURES A SPECIAL DELIVERY. Naraco builds its plating racks to exacting specifications – thus guaranteeing precision plating and "ON THE TARGET HITS."

Rely on NARACO'S know how in the manufacturing of racks for the munitions industry. Call the NARACO plant nearest you – TODAY.

NARACO

AMERICAN RACK CO.
4632 West 21st Pl. CICERO, ILL.

NATIONAL RACK CO., INC.
179-181 Madison Street PATERSON, N. J.

IMPERIAL PLATING RACK CO.
1613 Industrial Avenue FLINT, MICH.

Patent Abstracts

uniform thin coating of a metal from the group consisting of antimony, arsenic and bismuth, said electrodeposition occurring from an electroplating bath containing a salt of said metal with an assymmetric alternating plating current of a frequency within the range of 25 to 60 cycles and as the other component a direct current, the ratio of a.c.: d.c. being 2 to 4 volts R.M.S.: 2.5 volts d.c. at current densities within the range from about 2 to 15 amp/ft² for a period of time within the range from about 8 seconds to 1½ minutes, thereafter applying over said metal coating a coating composition of a vitreous enamel substantially free from bonding materials, and then firing said enamel.

1 claim, 3 figures, 4 examples.

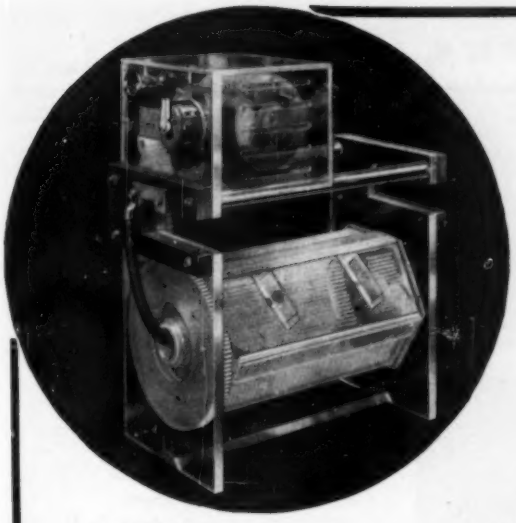
References cited: U. S. Patents 1,436,729; 1,785,389; 1,827,536; 2,020,477; 2,039,067; 2,039,068; 2,039,069; 2,060,530; 2,271,706; 2,351,811; 2,401,738. British patent 559,164. American Electroplaters' Monthly Review Feb. (1944), p. 168, Jones, Experiments with Alternating Current in Direct Current Electrolyte. Transactions Electrochemical Society, Vol. 41, pp. 151–180 (1922). Transactions Faraday Society, Vol. 24, pp. 348–358 (1928).

No. 2,616,840, November 4, 1952—Rhenium Plating—R. Levi, assignor to Philips Laboratories, Inc., Irvington-on-the-Hudson, N. Y.

CLAIM 1. The process of plating a predetermined thickness of rhenium upon a tungsten base, comprising the steps of electrodepositing on said tungsten base a first deposited layer of rhenium having a noncrystalline structure and a thickness substantially between 0.0001 inch to 0.0003 inch, heating said electrodeposited rhenium in a reducing atmosphere to a temperature of approximately 1000° C and converting the said first deposited layer to rhenium having a crystalline structure, electrodepositing on the first crystalline rhenium layer a second deposit of rhenium, heating said second deposit of rhenium and converting the said second deposit to rhenium having a crystalline structure, and repeating the said electrodeposition and heating steps until predetermined thickness of electrodeposited crystalline rhenium is produced.

LEGEND. This electroplating solution may contain for example: potassium perrhenate, $KReO_4$, 11 grams per liter, concentrated sulfuric acid H_2SO_4, the solution having a *p*H of 0.9. The temperature of the solution may be about 25° to 45° C. .... an anode of platinum. 5 claims, 3 figures.

References cited: U. S. Patents 1,565,724; 1,838,273; 2,138,573; 2,149,656; 2,195,499; 2,512,141. Mellor, Comprehensive Treatise on Inorganic and Theoretical Chemistry, Vol. 12 (1932), p. 468. Fink et al Transactions Electrochemical Society, Vol. 66 (1934), pp. 471–474. Holeman, Zeitschrift fur anorganische und Allgemeine Chemie, Vol. 202 (1931), pp. 277–291. Young-Metal Industry, Vol. 34 (1936), pp. 176–177.



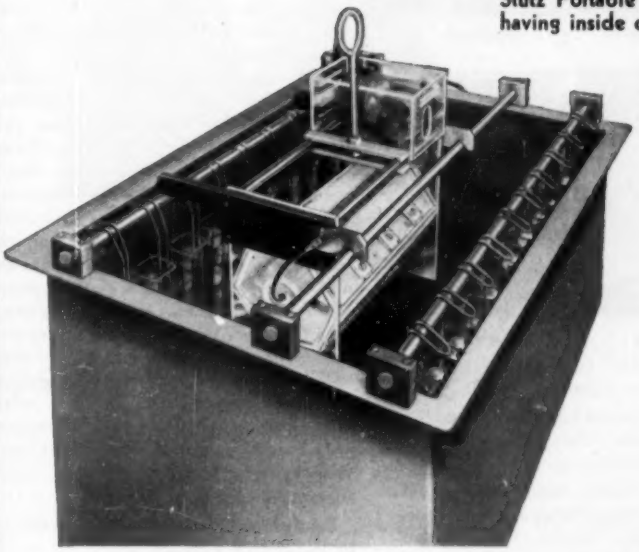
Design No. 1

the 1953 *Model* *Portable*

LUCITE

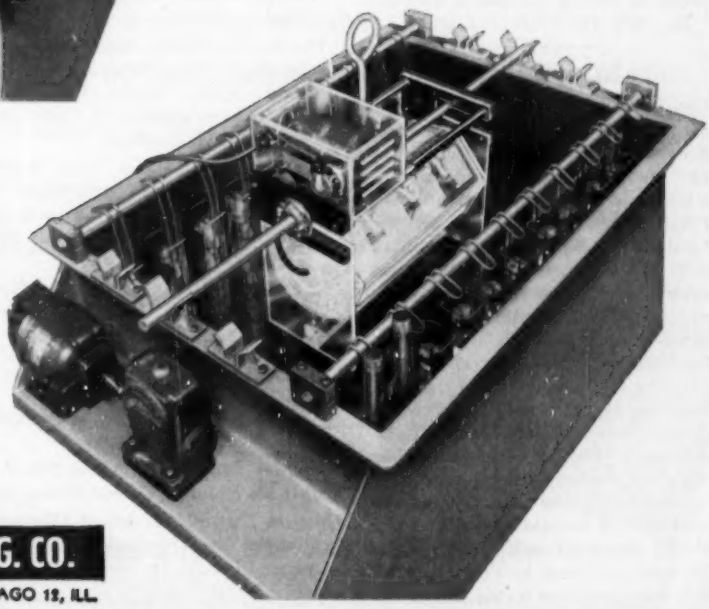
PLATING BARREL

THE STUTZ PORTABLE PLATING BARREL is designed and constructed of High Temperature Lucite to provide continuous processing of piece parts through the operations of Alkali Cleaning, Water Rinsing, Acid Treatment and Plating. Progression through these operations is made by manual handling or if necessary with the assist of an overhead traveling hoist. The Stutz Portable Plating Barrel is made in 2 sizes with cylinders having inside dimensions of 6″ x 12″ and 8″ x 18″. Standard perforations are 3/32″ or larger. Smaller openings can be furnished as required. All gears are 1/2″ High Temperature Lucite. Gear bearings are permanently lubricated. New heavy duty motor. Operating temperature up to 185° F.



DESIGN No. 2

In this arrangement our No. 2 design, either the Stutz 6″ x 12″ or 8″ x 18″ plating unit, is suspended across the tank rods with contact made forward. The cathode rod is moved off center thereby locating the plating cylinder centrally. Hoist lifting eye provided for mechanical handling if necessary.



DESIGN No. 3

The No. 3 shows this unit adapted to standard barrel plating tank. Center saddles are included to be mounted on the tank rim to receive the plating unit. The center rod required to handle the cylinder in this arrangement is removed when reverting back to the stationary plating tanks.

Write for new illustrated literature TODAY!

GEORGE A. STUTZ MFG. CO.

PEERLESS PRODUCTS

1643 CARROLL AVENUE CHICAGO 12, ILL.

A. E. S. News

Cover Photo Contest

PLATING announces a photographic contest open to all members of the A. E. S. The photos must be of a seasonal nature similar to those used as covers on the December issues of 1951 and 1952. Two prizes will be awarded in the contest with a cash award of $15 for first prize and one of $10 for the runner-up. The prize-winning photos will be used as the subject matter for the December, 1953 and January, 1954 covers of PLATING, with appropriate credit lines being made of the maker of the photo. Anyone can enter since photos will be judged on general picture appeal and also on their ability to produce a sharp photo engraving for good reproducibility. All photos should be of a minimum 8 inch by 10 inch size in a glossy finish. All entries must be received by October 1, 1953, properly identified with name of maker and a short identifying description of the location of the photo. Notice is being made at this time to give members the opportunity to take seasonal pictures, though old photographs taken in previous years are also eligible. Care should be exercised in the shipment of the photos to prevent their damage in transit.

Sustaining Members

The following firms have become sustaining members of the A. E. S. Their support of the Research Program is appreciated by the Research Committee.

Alert Supply Company, Los Angeles, Calif.

Metallon Products, Inc., Los Angeles, Calif.

Triple A Plating Company, Chicago, Ill.

Tricks of the Trade

The Editorial Board announces the start of a new column in the pages of PLATING under the title of "Tricks of the Trade" for which manuscript copy is now solicited. The subject matter for this new column should be limited to between 300 and 400 words and may be submitted directly to Headquarters or to any Board member. All copy should be in double-spaced form, in duplicate and the text should describe both briefly and clearly a metal finishing problem or one in an allied phase of the industry and the steps or measures taken to reach a successful solution to that problem. The Editorial Board reserves the right to reject any or all copy and its decision as to suitability for publication shall be final. Authors will be notified of all decisions and will receive a $10.00 award for each Trick of the Trade item published in PLATING. No limit is being made as to the amount of material any one contributor may submit.

Branch News

COMING EVENTS

GRAND RAPIDS BRANCH

ANNUAL EDUCATIONAL SESSION
AND DINNER-DANCE
Saturday, January 24, 1953
Educational Session at 1:30 P. M.

WALTER L. PINNER, Manager of Research, Houdaille-Hershey Corporation, Detroit, Mich.—Chairman

Pinner

Moline

Nixon

Lewis

PAPERS AND SPEAKERS

WILLIAM F. CARR, Engineer, Lear, Inc., Grand Rapids, Mich., "Autopilots and Guided Missiles"

WALTER E. MOLINE, Head of Electroplating Laboratory, National Cash Register Company, Dayton, Ohio, "Corrosion Characteristics of Electroplates and Inorganic Coatings"

CLEVELAND F. NIXON, Past President A. E. S., Head of Department of Electrochemistry, Research Division, General Motors Corp., Detroit, Mich., Subject to be Announced

B. F. LEWIS, Technical Director, Northwest Chemical Company, Detroit, Mich., "Surfactants"

CHICAGO BRANCH

41ST ANNUAL EDUCATIONAL SESSION
AND BANQUET

Saturday, January 31, 1953 at 2:00 P. M.
North Ballroom of Conrad Hilton Hotel

MYRON DIGGIN, "Technical Director of Hanson-Van Winkle-Munning Company, "Recent Developments in Precious Metal Plating"

R. W. REDMOND, Process Engineer, Oldsmobile Corporation, "Prefinishing of Steel"

DR. CHARLES G. MOORE, Technical Director, Glidden Company (Nubian Div.), "The Development of Modern Organic Finishes"

BANQUET
Grand Ballroom of Conrad Hilton Hotel
7:00 P. M.

BOSTON BRANCH

At the June 5 meeting in the Hotel Statler, Boston, the following officers were elected:

President—JAMES H. ANDERSON
First Vice-President—MYER SHAPIRO
Second Vice-President—DR. HAROLD NARCUS
Secretary-Treasurer—GEORGE P. SWIFT
Librarian—ELSTON FLORES
Sergeant-at-Arms—WILLIAM E. DAILEY
Board of Managers—MANSON GLOVER, LOUIS J. LOVE, ANDREW W. GARRETT

LOU GAGNON made the installation and Manson Glover presented the Past President Button to LENNY CHESWORTH, retiring President.

After the formal business, Mr. Chesworth, Chief Chemist—United-Carr Fastener Corporation, Cambridge, Mass., presented the problem of "Chromium Plating on Copper". His basic point was that a good bright copper was required which was not fulfilled by the ordinary Rochelle bath. Brighteners and a higher temperature was a "must". Bright coppers are not "cleaners" and old style procedures fall by the wayside. Good cleaning practice, filtration, removal of impurities and weekly processing with sulfides and activated carbon are a necessity as well as electrolytic purification at 1.5 volts. Copper plated parts must be chromium plated within one week now whereas previously nickel plated parts were sometimes held for two months.

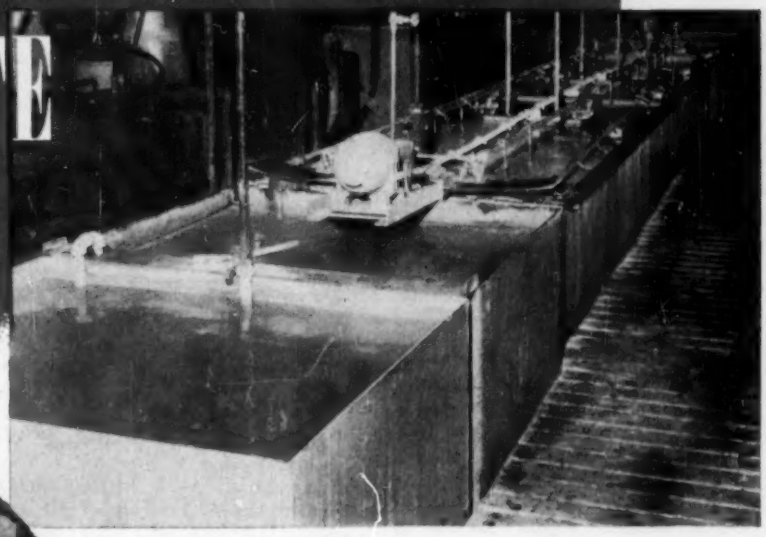
Sandwiches, beer and coffee were served by the Branch after the talk.

At the October 2 meeting the proposed $1.00 increase in dues for the Research Fund was discussed and the Boston Delegates were instructed to vote "yes". Discussion of the 1953 Boston Annual Meeting led to an acceptance of the date April 18, 1953 proffered by the Hotel Statler. It was also voted to send an observer, Lou Gagnon, to the New England Regional Committee at Hartford to determine whether or not cooperation was possible. Manson Glover discussed the Annual Meeting at Chicago but left out one important point. The secretary informed the Branch that Manson had received an "Award of Merit" from the National Society. Librarian Flores then presented MEYER SHACAT, New England Regional Manager of United Chromium, Inc., discussing "Advances in Industrial Chromium Plating". Mike discussed the self-regulating chromium baths with re-

ANOTHER LEADING PLATER

switches to

PROBRITE CR·723



DeSoi Plating Works, S. Pottstown, Pa., Finds Probrite Ideal Replacement for Nickel

a few CR·723 features:

- Costs less than nickel.
- Any shop can handle it.
- Can be plated over copper or steel.
- Readily chrome plated.
- Easily color-buffed.
- 200 hours or more resistance to red rust when treated with *new* Probrite Chrome Sealer.
- *Ask for details.*

DeSoi Plating Works, like many other platers throughout the country, has found that Probrite CR-723 is far more than just a substitute for nickel. It is an entirely new finish with many desirable characteristics of its own that warrant changing over to it regardless of the availability of nickel.

At the left are listed just a few of CR-723 advantages. Look them over. Send for information. Ask for samples. You'll be glad you did!

SEND FOR BULLETIN

describing Promat products for better plating.

PROMAT *Division*

Poor & Company 851 S. Market St., Waukegan, Ill.

REPRESENTATIVES IN PRINCIPAL CITIES
Licensed manufacturer for countries outside North and South America:
M. L. Alkan, Ltd., Long Drive, Greenford, Middlesex, England.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 161.

spect to current efficiency, smoothness, brightness, speed of plating, fatigue strength and possibilities of furthering barrel plating use. Slides illustrated all points.

After a short question period, the meeting adjourned at 9:30 P. M.

At the November 6 meeting 3 new applications were read and voted membership, plus 1 reinstatement.

Lou Gagnon reported that there had not as yet been any meeting of the New England Regional Committee.

President Anderson announced the appointment of Myer Shapiro as Chairman of the 17th Annual Technical Session and Banquet of Boston Branch on April 18, 1953.

Librarian Flores introduced WILLIAM F. NICKERSON, Chief Chemist of Magnuson Products Corporation of Brooklyn, N. Y., discussing "Cleaners for Electroplaters". Mr. Nickerson started his talk by recommending that all members read A. E. S. Research Report No. 18 on cleaners. He then went into a general discussion including classification, analytical appraisal, presoak tanks, electrocleaners, barrel cleaning and deburring, pretreat cleaning tanks, washing machines and reclaim tanks. All headings used charts which were completely blanked off at the start and the tape peeled off to reveal the topic as the talk progressed.

The meeting adjourned at 10:00 P. M. after a brief discussion period and was followed by beer, coffee and Coca-Cola through the courtesy of Magnuson Products Corporation, and their new local representative, NORMAN PETERSON.

GEORGE P. SWIFT, *Secretary*

CHICAGO BRANCH

The meeting of October 10 attracted 85 members to hear R. ATWOOD of the Bersworth Chemical Company read an informative paper on "Versenes" and their applications in electroplating. He described the purposes of this new chemical product and explained its chelating effects in controlling metallic contaminations ordinarily present in plating and pickling baths. This unique chemical performance was amply illustrated with slides and graphs together with various case histories on widely used plating baths. An interesting question period gave evidence of the tremendous possibilities which Mr. Atwood's presentation initiated among Chicago platers.

PRESIDENT R. LEDFORD introduced the following new members to the Chicago Branch: R. STEWART and C. BRECKENRIDGE, The Sarco Co.; A. PARKER, Dearborn Chemical Co; W. ARMSTRONG, Danville Plating Works; J. COOPER, Frederic B. Stevens Co.; D. TRAPP, Durebilt Mfg. Co.; A. SIMMONS, Craftsman Plating Co.; B. MEYERS, International Harvester Co.; R. and J. STONEKING, Victor Casket Hardware Co.; R. MILLER, Stewart-Warner Corp.; R. ROHR, Mitchell Bradford Chemical Co.

CHAIRMAN E. MCCOY of the Research Finance Committee announced the subscription of AAA Plating Company, Chicago, as the newest sustaining member.

"THEY WERE THERE" DEPARTMENT

L. PRAVEL describing the trials and tribulations of operating his own business . . . J. VALLONE after 18 years with Croname has cast his lot with the Frederic Gumm Chemical Co. as a field engineer for Clepo cleaners. . . . We note the growing tendency of solid company representation as witnessed by the following groups: O. J. SMITH, A. R. KLOMP and N. FITZSIMMONS of the Sunbeam Corp.; J. C. BRAMSON, R. MCCORMICK, E. N. BABCOCK and H. HUIZINGA of Ford Aircraft Division; W. STRELOW, F. MARTINEK and J. CURRY of Hotpoint; J. GALENTI and A. LEONARDO of Driscoll and Co.; H. STOPEK and J. KRAFT of Kraft Chemical Co. . . . K. PETROSIUS can't leave Chicago and we're happy about it. . . . still makes the trek from Kenosha where Nash-Kelvinator keeps him busy. . . . F. MICKELSON of Motorola earning his spurs in the Chicago activity. . . . D. ARMSTAONG and E. GRYGLAS discussing their problems. . . . And how about W. VARNISH making two meetings in a row! . . . One of the nicest things about Chicago Branch meetings is MISS IRENE DONNELLY. . . . Still hearing compliments on the September meeting. . . . apparently S. MODJESKA, R. HARR and W. HODGES created a stir with their symposium on metal thickness testing. . . . L. CLARK and O. TOWNER recuperating from hospital visits. . . . Get well quick!

R. HAZUCHA, Banquet Chairman, announced that plans are well along for Chicago's annual banquet to be held Saturday, January 31, 1953 in the Grand Ballroom of the Conrad Hilton Hotel. An excellent dinner, first line floor show and dancing to Lou Breese and his orchestra will make for a superlative social event. Tickets will be $10.00 per person.

J. ANDRUS in planning a varied educational session for the January annual meeting. The program will embrace three general topics of interest to all platers and will include papers on organic finishing, precious metal plating and electrolytic pickling.

EDWARD STANEK, *Secretary*

CHICAGO BRANCH

One hundred and twenty members turned out on November 14 to hear HANK KELLNER's paper on bright copper plating. His informative presentation resulted in a lively question period in which S. LEWIS DOUGHTY assisted. Dr. Kellner, Lea Manufacturing Company, brought along a variety of plated articles to demonstrate the advantages of his copper plating cycle.

The educational session was preceded by a cocktail hour and a dinner which was also well attended.

WILLIAM E. BELKE, president of Belke Manufacturing Company, explained the technical scholarship plan which his company inaugurated at Northwestern University this year. The two successful applicants are ROBERT BLUMENTHAL and GERALD GLAB, both of Chicago. After a six-year program of study and working in electroplating plants, they will receive a bachelor of engineering degree in metal finishing.

The ladies' convention committee attended the dinner meeting and met later to write their final report on the successful activities at the June convention in Chicago. The following ladies were present: MRS. MARIAN LONGFIELD, MRS. RAY LEDFORD, MRS. ELMER OLSON, MRS. PAUL GLAB, MRS. HAROLD FAINT and MRS. EDWARD STANEK.

An interesting sidelight on the meeting was the presence of several father and son members. This prompted MR. GILBERTSON to comment on the good omen this presented for the future of branch membership growth. The following senior-junior combinations were noted: PAUL GLAB and son GERALD, WILLIAM BELKE and son RALPH, GEORGE STUTZ and son GEORGE, JR.

THEY WERE THERE . . .

Ardco, Inc., turned out in full force to hear Hank Kellner. Their delegation included JIM HICKEY, NEAL FARMER, TOM DAVY, M. E. STEIBNAGEL, BILL HOSKINS, and BOB RUENZEL. ART JENKS of Stutz got the big hellos after a long absence from Chicago Branch affairs. HARRY HANSEN of DuPont worried about whether he will be included among the defendants. ROY JOHNSON of Belke stunned a few people by his presence. MARION VATIKUS of Western Electric getting acquainted. KEN EDSTROM recently of Ford, now associated with Mall Tool. GENE GRYGLAS real happy in his new job at Cinch Manufacturing. VINCE FARR and HENRY DOBLER promoting a soda fountain installation for the lounge. Bell & Howell's BARTMAN and HUBRICH taking over for the camera industry. RAY LEDFORD now in the filter business as sales manager for Industrial Filter and Pump Manufacturing Company. VERSTAGEN, ZUCKER and BECVAR meeting all comers for Hanson-Van Winkle. BOB STEWART and CHARLIE BRECKENRIDGE checking the thermostats in the dining room. ART ENGDAHL of Kocour back in harness after recovering from that rich man's disease, the gout. CHET DOMBROWSKI of Colonial-Premier would like more floor lamps in the reading room.

CINCINNATI BRANCH

The Branch held its annual inspection trip on November 19, when approximately 50 members and their guests visited The Ford Motor Company's new automatic transmission plant in Cincinnati. Of particular interest, naturally, was the new plating department while all were amazed at the efficiency of the production line where the transmission is put together.

Plans are rapidly going ahead for the Branch's 1st Annual Educational Meeting and Dinner-Dance to be held on March 28, 1953. An unusually high calibre of speakers is being assembled by RAY BARRY and his Committee. Further details of this function are to be announced shortly.

The Cincinnati membership was indeed saddened to learn of the very sudden passing of MARTIN M. GANNON, JR., on November 20. Marty had attended the plant visitation the night before his death and appeared in fine shape. He contributed greatly to the successful growth of the Branch in recent years, was a most willing worker whose pleasant personality will be sorely missed.

CHARLES WISE, *Secretary*

HARTFORD BRANCH

A regular meeting was held at the Bond Hotel on November 17, and 67 members and guests were present. Preceding the meeting a color film, "The Story of Gasoline", was shown. Following the movie GEORGE HOGABOOM spoke briefly on "Latest Developments" in the plating field.

The guest speaker of the evening was MR. PERRY SLOANE, Technical Director of Donham Craft, Inc., whose subject was "Bulk Plating of Precious Metals to Specification". Mr. Sloane spoke chiefly on the specification plating of gold and silver for industrial use such as heavy silver deposits for bearing surfaces, and gold and silver on electronic parts for conductivity or corrosion resistance. The plating of precious metals for the above use is more complicated because closer tolerances must be observed and the plating is done on various metals and alloys. Practical hints to obtain high production in gold and silver plating were mentioned as also were the bath compositions. Decorative gold plating was touched on briefly.

MR. EMILE BELOIN of the W. D. MacDermid Chemical Company was technical chairman.

STANLEY PLATOZ, *Secretary*

INDIANAPOLIS BRANCH

The November 5 meeting of the Indianapolis Branch was held at Fox Steak House with 27 present for dinner and 12 additional persons present for meeting and program. VICE-PRESIDENT AL KRIESE presided.

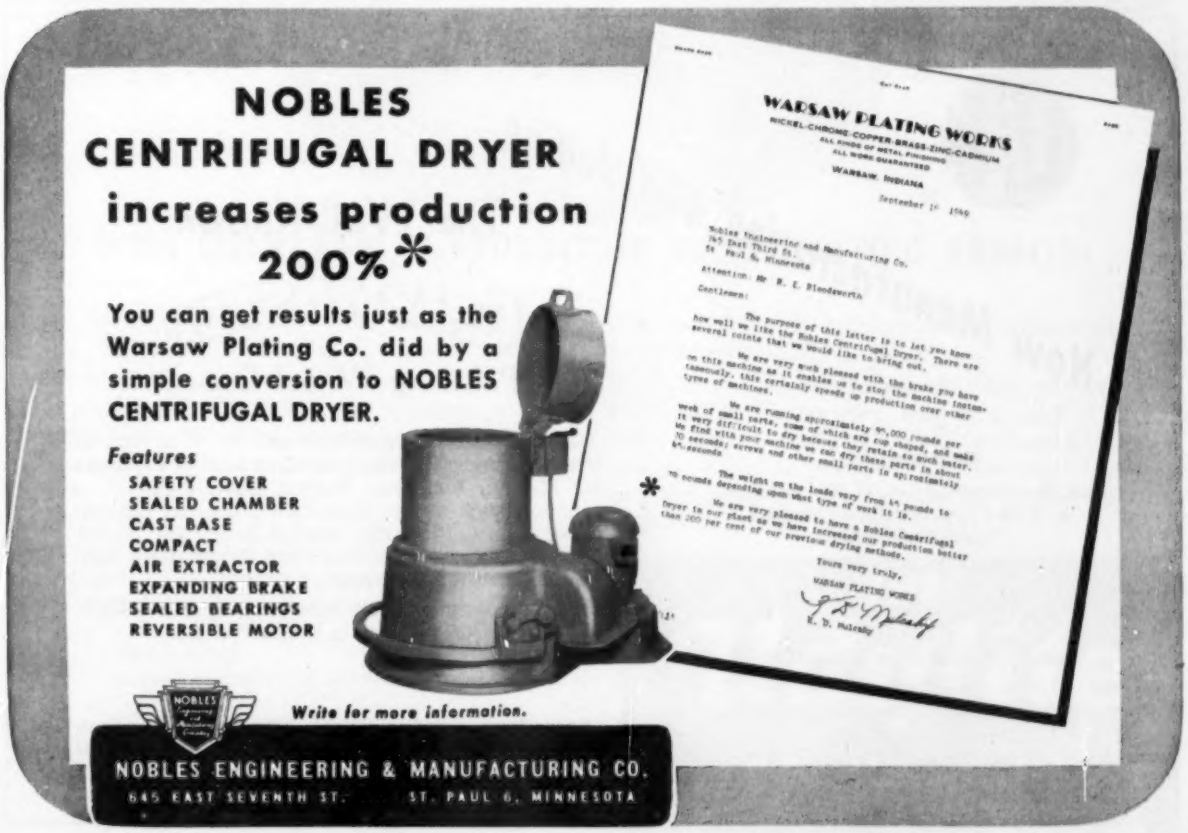
Under old business a report was given to the membership about the bank balance in the checking account. It was suggested it be left for further accumulation for a national convention in the future.

MR. ROBERT RULEFF of the Dayton Branch was present and extended an invitation to their educational session and dinner-dance on April 18, 1953 at the Biltmore Hotel.

MR. HERB KENNEDY, a member of our Branch but a resident of Cincinnati, announced the Cincinnati Branch educational session and dinner-dance which will be March 28, 1953 at the Sheraton-Gibson Hotel.

At 8:30 P. M. the program began which was a round table discussion of "Generators vs Rectifiers" with MR. ED BRUCK as moderator. This proved to be a worthwhile topic and much discussion took place by all present. The two types of equipment were compared as to their cost, operating efficiency, power factors, flexibility, overload and endurance. Three charts were presented by Mr. Bruck which helped the group see the comparisons. Refreshments were served along with the program. The meeting adjourned at 9:55 P. M.

EDNA ROHRBAUGH, *Secretary*



LANCASTER BRANCH

A monthly meeting was held November 14, at the Old Mill Inn, Lancaster, Pa. Thirty-five members and guests were in attendance. Two applications for membership were presented to the Branch.

After all routine business was transacted, the speaker, Mr. Vernon Burr of the United Chromium, Inc., was introduced by Fred Fulforth. Mr. Burr talked on "Hard Chrome Plating". After a brief introduction on the difference between hard and soft chrome plate, he presented the S. R. H. S. bath as a means of obtaining the hard chrome plate. The chief advantages of this bath are that it is high speed, throws a smooth plate, and the bath is self-regulating. Mr. Burr then discussed the best manner to operate the bath.

After Mr. Burr answered a number of questions, the meeting was adjourned.

Harry A. Saylor,
Secretary-Treasurer

LOS ANGELES BRANCH

Mr. Paul Craig, of the Manco Plating Company of Los Angeles, was the guest speaker at the meeting held on October 8, 1952, and gave a highly informative and interesting talk on "Hard Anodizing of Aluminum".

The new hard anodizing process has been developed over the period of the past few years, and has been generally practiced under methods developed by the Martin Aircraft Company and Alcoa. The process now in use at Manco is the Alcoa process using an electrolyte of approximately 12 per cent by weight of sulfuric acid and 4 per cent by weight oxalic acid. The bath is operated for most alloys at a current density of 36 asf and a temperature of 50° F for most alloys. A normal film thickness of 1 mil is obtained in 20 minutes under these conditions.

Mr. Craig's experience indicated that these films are sometimes as good as hard chrome, falling within the range of 9 plus on Mohs' scale, but are still absorptive enough to retain films of dichromate or oil. Films can be obtained in thicknesses of up to 5 mils which is much greater than those obtained in regular anodizing.

It was indicated that the hard anodizing process was more expensive due to the high power factor required, refrigeration, and increased labor necessitated by the extreme care which must be used in racking the parts. The film formed increases the size of the part approximately one-half the thickness of the film, with the consequence that many precision parts cannot be stripped and re-run on account of the large change of dimensions involved.

Not all alloys can be successfully anodized by this method. Alloys with over 7 per cent silicon, or high in copper, including 24 ST, may burn in the bath. Alloys such as 2S, 3S, 61 and 75 all seem to work satisfactorily. Another handicap in using the process is the lack of definite specifications to work by, and the small amount of information about the process in general.

Information brought out in the question and answer period indicated that the voltage range is from 22 to 60 volts, and that a constant amperage has to be maintained. The color of the film varies from gray to black, and this is one reason the hard films are not dyed. Very high agitation is required, and generally violent air agitation is supplemented by anode bar agitation. The bath is not too difficult to control, with the oxalic acid being used at a faster rate than the sulfuric acid. The throwing power is good, but parts, especially the high copper alloys, should not be allowed to shade each other or etching may occur. If maximum hardness is required the parts are not sealed, but are dried and oiled.

The meeting was adjourned at 10:10 P. M. by President Myron Orbaugh.

Earl W. Arnold, *Secretary*

LOS ANGELES BRANCH

Dr. Leslie E. Lancy, independent consulting engineer, of Ellwood City, Pa., was the guest speaker of the November 12 meeting. His talk was entitled "Electroplating Research and Technical Problems", and principally covered waste

Now Manufacturing and Selling

The Well-Known

GRIPMASTER®

Polishing Wheel Cement

Send orders to

LEA Manufacturing Co., of Michigan, Inc.
P. O. Box 3943, Strathmore Station,
Detroit 27, Michigan
Phone: Webster 3-5558

* * *

Inquiries and other requests to

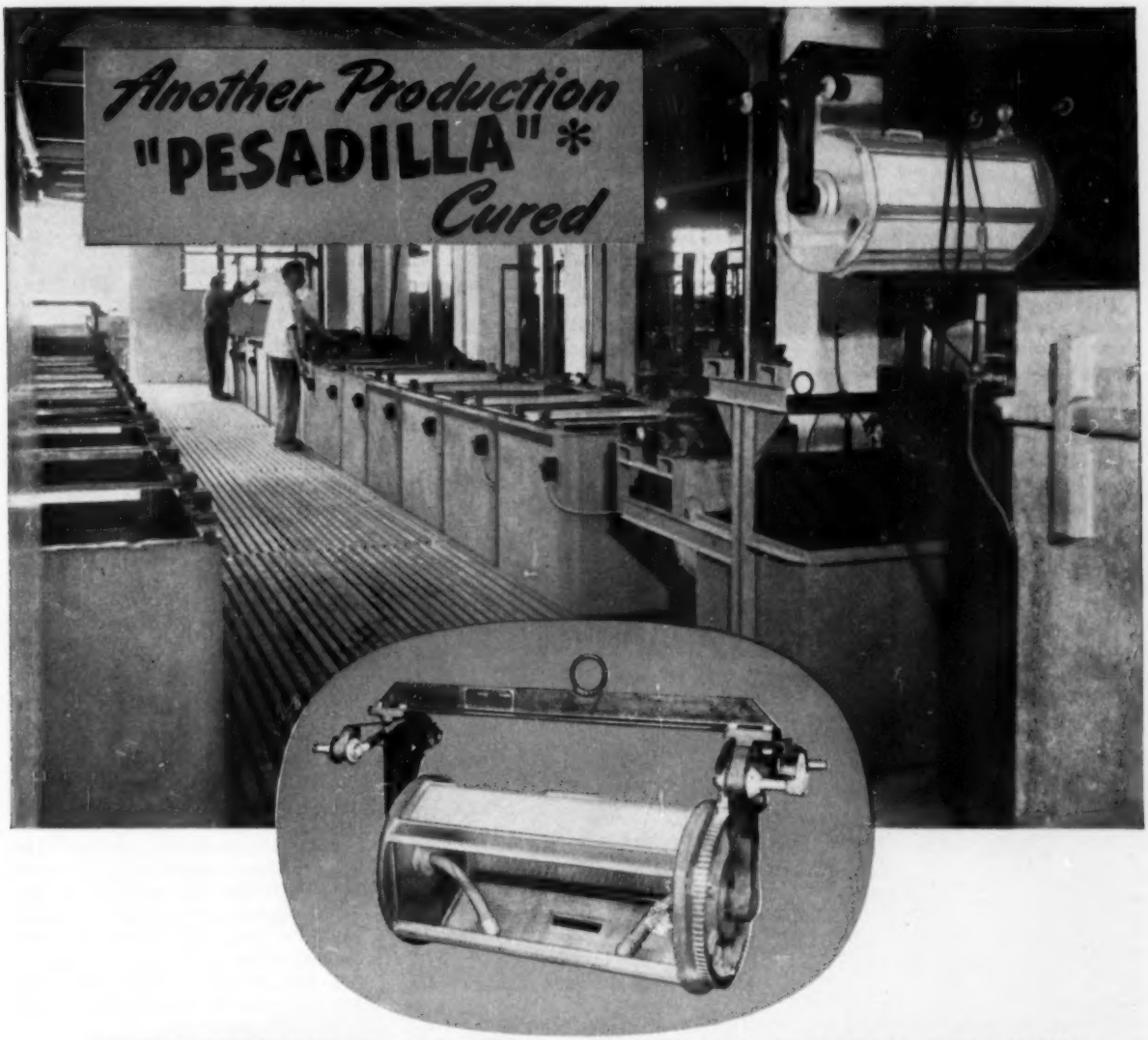
Dee F. Mosher
550 South Glenhurst
Birmingham, Michigan
Phone: Midwest 4-9051

Through personal experience and by wide reputation, you know favorably the Lea Line of Products for Plating, Polishing, Buffing and Burring . . . products such as Lea Compound, Learok, Leabrament, Lea Liquabrade, Ad-Lea-Sive, Lea Nickel Glo, Lea Copper-Glo, Lea-Clad Bright Cadmium Process, Lea Kromsavers.

You can continue to put your confidence in GRIP-MASTER Cement, now a product of Lea.

* * *

LEA . . . Burring, Buffing, Polishing, Plating and Spray Coating . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions.



WITH **UDYLITE** HI-PRODUCTION LUCITE PLATING BARRELS!

Here's what Mr. J. Sulser, owner and operator of one of Rio de Janeiro's most up-to-date plants†, thinks of Udylite equipment.

"Our plant practically runs itself. No more production headaches. No more dangerous bottlenecks or equipment breakdowns, thanks to our twenty-one Udylite Plating Barrels."

After creating his new South American barrelplating plant built around Udylite equipment, Mr. Sulser is getting high production, low dragout losses and *NO* overtime! And what's more, he's getting all these benefits with work normally considered too small for barrelplating.

If you're having production troubles, why not let The Udylite Corporation help you, too? A complete research staff . . . plus production know-how . . . are at your service. See your Udylite technical representative or write direct. *The Udylite Corporation, Detroit 11, Michigan.*

*HEADACHE

† Companhia Fábrica De Botões E Artefactos De Metal

PIONEER OF A BETTER WAY IN PLATING

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

treatment and the problems encountered in this field.

In the talk, it was pointed out that waste treatments must be specialized in order to lower the costs and still perform efficiently. General treatment of wastes should be as simple as possible and operate on a continuous basis wherever possible. These treatments usually consist of chlorination and chemical precipitation.

Dr. Lancy's slides on neutralizing systems and tanks gave an excellent pictorial presentation of this subject. His suggestion was that the treatment tanks should usually follow the dragout tank prior to the final rinse, with enough water kept flowing to prevent discoloring or harm to the work. The treatment tank is then piped to the clarifier or chlorinator and then to the treatment reservoir tank.

Dr. Lancy recommended careful planning, with an integrated disposal system being the best. This eliminates a separate building or plant, with a consequent saving in space and initial cost.

An integrated system also shows a savings in treatment of chemicals, less control is required, no separate personnel needed, and rinse water is free of high dissolved salt content, and can sometimes be re-used. This system is not considered waste treatment entirely, but may be considered abatement, i. e., not generating any waste.

An active question-and-answer period followed Dr. Lancy's excellent informative talk, and the meeting was adjourned at 9:40 P. M.

EARL W. ARNOLD, *Secretary*

LOUISVILLE BRANCH

A regular meeting of the Louisville Branch was held October 16, at Korfhage's Restaurant, Louisville, with a dinner served at 6:30 P. M. PRESIDENT ARTHUR A. OERTEL opened the business and open meeting at 8:00 P. M. with 26 members and guests present. It was nice to see GERHARD HILLEBRAND at the meeting. We hope he will continue to come. TOM ALLISON introduced the following guests: JAMES GROTE and HARRY WUEBOLD of the Globe Chemical Company and TOM WALSH of the American Standard and Sanitary Corporation.

The Amendment to the Constitution and By-Laws to increase the dues $1.00 per year for the research fund was approved and delegates were instructed to vote in favor of the amendment.

TECHNICAL SESSIONS CHAIRMAN S. J. BEYER introduced the speaker of the evening, MR. H. W. KENNEDY of the E. I. duPont de Nemours Company, Wilmington, Del.

At this point refreshments were ordered —courtesy AL STEIDLE of the Steidle Chemical Company, Louisville.

Mr. Kennedy spoke briefly prior to the showing of a film entitled "The du Pont Story", which traced the development of the duPont de Nemours Company from 1802 to date. After the picture, Mr. Kennedy spoke on the subject, "Effects of Impurities in Cyanide Plating Solutions", which can be summarized as follows:

1. Impurities such as lead, iron and chromium are tough to control, detrimental to bright deposits and will cause streaky, brittle and blistered deposits.

2. To put the solutions into good operating condition, clean the anodes, remove sludge from the bottom of tanks, filter with activated carbon using 4 lbs to 100 gals for at least three hours, and dummy the bath at low current density overnight.

3. Keep chemicals of the bath within proper concentrations including the *p*H which is also important.

Considerable discussion followed and Mr. Kennedy was given a rising vote of thanks for a very interesting talk and picture.

Refreshments, courtesy of the E. I. du Pont de Nemours Company, Wilmington, Del., were served and the meeting adjourned at 10:30 P. M.

JOSEPH G. STERLING,
Secretary-Treasurer

NEW YORK BRANCH

A regular meeting was called to order by PRESIDENT A. AMATOR on October 10, at the Hotel Statler, New York.

Applications for membership were received from B. D. LOVELOCK and C. LAMBERT.

The following men were accepted for membership, and duly installed: U. GOTTLIEB, S. RATOFF, L. NEIHEIM.

The following transfers were read, and accepted by this Branch: FRED NADEL (Newark), WILLIAM LAISTEIN (Newark), KENNETH GREEN (Cleveland).

Do a THOROUGH Cleaning Job...

On CHIPS and SOLID DIRT As Well As OIL and GREASE!

Effective, low-reject finishing and plating depend on the removal of stubborn chips, abrasives and other *insoluble* dirt, just as much as on cleaning away oil and grease. Degreasing operations do only part of the cleaning job. Make it a

"One-For-All" Operation

Use the one cleaning machine that provides *mechanical* scrubbing action to augment the solvent and chemical action of the cleaning solution. The Magnus Aja-Lif Cleaning Machine gives you a vigorous shearing and scrubbing action on solid dirt particles, as it moves the work up and down in the solution many times a minute. Each time the direction is changed, the cleaning solution shears away more insoluble chips, abrasives and other particles. You get *really* clean work.

The Fastest Cleaning There Is

It's thorough . . . and it's *fast*—unbelievably fast. Aja-Lif cleaning—with any cleaning solution—is two to ten times faster than any other method. And as to manpower . . . it's a less than one man operation, because the operator can do other work while the machine automatically cleans.

For complete information, write for Bulletin 703-AL—or a demonstration on your own work.

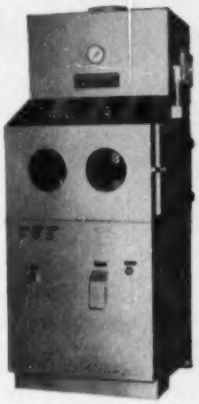
MAGNUS CHEMICAL CO. • 41 South Ave., Garwood, N. J.
In Canada — Magnus Chemicals, Ltd., Montreal.
Service representatives in principal cities.

MAGNUS
CLEANERS • EQUIPMENT • METHODS

INTRICATE DEBURRING AND DESCALING PROBLEMS?

The NEW Cro-Plate PRESSURE-BLAST

high-velocity wet-blasting method will solve them in *Seconds!*

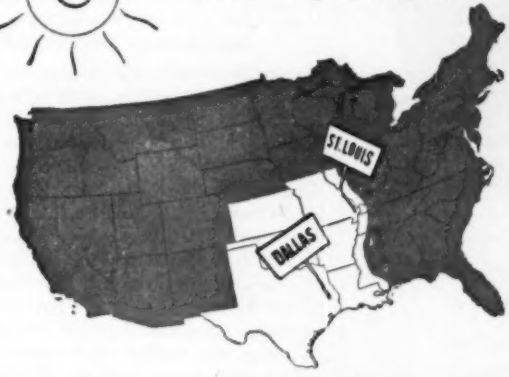


PRESSURE-BLAST has *no moving parts* to cause trouble—needs only a ½" air and ½" water connection for immediate operation. 5 standard models or custom units available. Ideal for:

- Intricate Deburring • Descaling
- Surfacing to micro-inch 2
- Finishing to tolerances of .0001"
- Controlled stock removal
- Blending directional grinding lines
- Pre-plating and painting cleaning

We will gladly arrange for PRESSURE-BLAST processing of your samples without obligation. Write for full details.

Our service "shines" all over the great Southwest



Southwestern Sales and Service Representatives for these Famous Firms:

- THE UDYLITE CORPORATION
- JOSEPH R. DAVIES & ASSOC. ("Joe-D" Sisal Buffs)
- R. O. HULL & COMPANY
- INDUSTRIAL ELECTROPLATING COMPANY (Niehaus Fume Separators)
- MacDERMID, INC.
- TOPPER EQUIPMENT COMPANY ("Circo Degreasers")
- FREDERIC B. STEVENS, INC.
- ALROSE CHEMICAL COMPANY (Jetal Process)
- ALLIED RESEARCH PRODUCTS (Iridite)
- ALMCO DIVISION, QUEEN STOVE WORKS

—and many others

Branch News

Mr. Schore announced that Mr. Stanley Goodis had passed away, and a motion was made by Mr. G. Herrmann that a page be set aside in the Annual New York Branch Book in his memory. Mr. Schore gave a final and complete report on the National Convention that was held in Chicago.

The Amendment to the Constitution and By-Laws, to increase the minimum dues and Per Capita Tax for the support of Research, was approved in a motion by G. Herrmann and seconded by G. Schore, that the New York Branch pay $1.00 per member, per annum, for the Research Program.

After the business session the meeting was turned over to Librarian P. Veit, who presented a motion picture on "Barrel Plating", by Frederick B. Stevens, Inc.

A regular meeting was called to order by President Amator, on October 24, at the Hotel Statler, New York.

All old and new business was tabled for the next meeting, to be held November 14, 1952.

The meeting was then turned over to Librarian P. Veit, who in turn presented Mr. Nadel, Finishing Supervisor of Berkley Industries. Mr. Nadel gave a very interesting talk on plating solutions, defects and their remedies.

A regular meeting was called to order by President A. Amator, November 14, at the Hotel Statler, New York. Mr. Amator had the pleasure of announcing the presence of the following officers of the National Society: Mr. F. MacStoker, President; Dr. G. P. Swift, First Vice-President; Mr. C. Kelly, Third Vice-President, and Dr. D. G. Foulke, Executive Secretary.

We also had the pleasure of the following out-of-towners at our meeting: Mr. Glassner, Chicago, and Mr. Glover, Boston.

Applications for membership were received from the following: H. Karron, E. Karron, J. Krobel, T. Slattery, R. Wasilewski, and T. Susskind.

The following men were elected to membership and duly installed: Payne, Modonaca, LaRosa, Anderson, Lambert, and Lovelock.

Mr. A. Fusco, Chairman of Banquet Committee, reported progress and also announced that the tickets will be $8.50 per person, and the date February 14, 1953, at the Hotel Statler, Grand Ballroom.

The meeting was turned over to Librarian P. Veit, who presented Mr. S. Olphie. Mr. Olphie gave a talk on "Rust and the Plating of Stainless Steel".

Mr. J. Sterling was then presented, and he gave a talk on the old-time methods of plating.

Lester Levinson,
Recording Secretary

PROVIDENCE-ATTLEBORO BRANCH

A regular meeting was held at the Providence Engineering Hall on October 20.

Branch President Frank W. Boothroyd appointed Gerry Nooman to plan a Christmas party like the grand party he planned last year.

Mr. Edwin Rinker, Technical Director of Bart Laboratories and Sel Rex Precious Metals, Inc., was introduced as the speaker for the evening.

The subject, "Bright Gold Plating", was detailed, and plated pieces were shown. We learned it was possible to plate fine gold to a thickness of 0.003 to 0.004 inches and higher, and still keep a very bright surface. The solution builds brightness, but not to the extent of bright nickel. The fine grain bright plate is hard and wear resistant. Some industrial use for corrosion resistant parts have been very successful. This new plate will probably find many uses.

The talk was followed by a long discussion, mostly about what the jewelry industry could call a plate of this kind which would distinguish it from gold coloring of very thin coatings.

The meeting was adjourned at 10:35 P. M.

G. A. Gibbs, *Secretary*

ROCHESTER BRANCH

Over 50 members were in attendance at the 40 & 8 Club on October 20 for a regular meeting. During the business session a discussion was held concerning the proposed increase in per capita tax, correspondence was read and discussed, and a committee consisting of P. Pasnak, D. Blum and V. Schaeffer was appointed to handle arrangements for the annual Christmas party to be held December 20 at the Leiderkrantz Club. Eleven new members, approved by the Board of Managers and general membership, were welcomed into the branch by President Lenzi.

Following the business meeting, Librarian Ed Wallin introduced J. Winters, Technical Director, R. O. Hull & Company, who spoke on "Practical Control of Plating Solutions by Use of the Hull Cell". Color slides and a working demonstration supplemented the talk which was ably presented and well received by those present. A hearty vote of thanks was extended to Mr. Winters for his presentation. To round out the evening refreshments were served as usual.

Ed Wallin, *Secretary*

ROCHESTER BRANCH

The November meeting of the Rochester Branch was held on the 17th at the 40 & 8 Club, 933 University Avenue. The speaker of the evening was Mr. Arthur Kirkpatrick of F. B. Stevens, Inc., who spoke informally on the necessity for automatic equipment in today's plating operations in order to maintain a competitive position. He discussed some of the factors which contribute to this necessity and answered specific questions from the floor in the course of the discussion.

Following Mr. Kirkpatrick's talk, the F. B. Stevens movie, "Industrial Album", which shows the materials handling and automatic barrel plating facilities at Shakeproof, Inc., Division of Illinois Tool Works was viewed. At the business meeting the Christmas party committee reported on detailed plans for the annual branch Christmas party to be held this year at the Liederkranz Club on December 20. Tickets were distributed and will be available from several of the members.

A motion was also passed that the Rochester Branch investigate the possibilities of making available testing facilities, particularly salt spray, to shops who have no such facilities but who are faced with the necessity of meeting requirements of government specifications on defense contracts.

Following the meeting refreshments were served through courtesy of F. B. Stevens, Inc.

E. Wallin, *Secretary*

ST. JOSEPH VALLEY BRANCH

A regular monthly meeting was held at the Hotel Elkhart, Elkhart, Ind., on November 5. Thirty-two members and guests were present for the dinner and 38 attended the technical session.

The following applications for membership were received: Robert Morgan, Owner, Lake City Electroplating Works; Everett Lee Bronsey, Finishing Foreman, U. S. Slicing Machine Company; Edwin J. Krook, Assistant Foreman, Yale & Towne, Corporation; James M. Stafford, Plating Foreman, Decatur Polishing Company.

William McDowell reported on the membership drive.

The financial status of the Branch was reported by the Secretary.

The Secretary was instructed to return the Branch ballot approving the changes in the Constitution and By-Laws to add $1.00 to the dues to go into the Society Research Fund.

Our President, Dick Lockerbie, then turned the meeting over to Librarian Ralph Brouwer, who introduced our guest speaker, Dr. Walter R. Meyer, of Enthone, Inc. The topic chosen by Dr. Meyer was "Adhesion of Electrodeposits and New Methods of Cleaning and Oxide Removal". With slides and black-

Are you SURE you're using THE MOST EFFICIENT FINISH?
If your production involves finishing zinc, cadmium, aluminum or cuprous metals, you owe it to yourself... and your customers... to investigate
IRIDITE®
for on any of these metals Iridite gives you a high performance finish at a low cost from a simple chemical dip.
IF YOU WANT HIGH CORROSION RESISTANCE,
you'll find an Iridite that will meet any military or civilian specifications for chromate finishing.
IF PAINT ADHERENCE IS IMPORTANT,
you'll find Iridite prevents underfilm corrosion and soap formation.
OR, FOR BRIGHT, DECORATIVE FINISHES—
investigate zinc plate and Iridite (Bright) for a chrome-like decorative finish with more corrosion protection than conventional chrome plating . . . or Iridite (Metcote) as a treatment for copper that eliminates the need for buffing in the copper-chrome system; produces a sparkling bright finish!
Write for literature and send us samples for test processing. See "Plating Supplies" in your classified telephone directory or write direct.
Iridite is approved under government specifications.
ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD
Manufacturers of Iridite Finishes
for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Brighteners.
West Coast Licensee: L. H. BUTCHER COMPANY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 168.

board demonstrations, Dr. Meyer presented among many most interesting points the following main thoughts:

1. Adhesion and bond strength depend to a great extent on the distortion of the base metal due to polishing and buffing which may reach as high a surface temperature as 1500° F, causing plastic flow which gives structurally weak electrodeposit with poor bond strength despite high adhesion.

2. Carbon inclusions due to mechanical finishing operations, pickling or cleaning may cause poor throwing power because of hydrogen discharges which occur readily due to the carbon. This may cause blisters to appear days and even weeks after parts have been plated. This is particularly true of zinc and cadmium plating and to a much lesser extent of copper plating.

3. Preferential attack by cleaners on base metals such as steel or zinc diecastings develops smut which contributes to poor adhesion.

4. Hydrogen embrittlement caused by hydrogen occlusion in the base metal due to cleaning and pickling causes terrific internal pressures which will lift off the plate or paint.

5. Hard electroplating deposits often mistaken for hydrogen embrittlement cause parts to break or scale off. The suggestion is to use more ductile plating deposits.

6. Micro throwing power which occurs in 0.001 to 0.005 inch deep holes is best in low potential metals.

7. Diffusion plate often thought as leaving the plating deposit high and dry on the surface of the metal ordinarily still has good adhesion, but due to the brittleness of the new alloy formed by this diffusion the electrodeposit has very poor bond.

8. Poor bond strength can often be traced to metallic impurities in the plating solution.

9. Causes of pitting—the usual causes of pitting include: excessive hydrogen discharge; ferrous hydroxide; oxygen content in bath given insufficient time to dissipate before plating is started (more absorbent in cold solution than hot solution causing pitting at start of shift or Monday morning start); presence of organic impurities in the water source such as algae, etc.

Dr. Meyer answered many questions from the floor and also explained the use of alkali rust removers, pretreatments of stainless steels, vanadium, tungsten, and other alloy steels, aluminum and lead metal cleaning troubles.

The meeting adjourned at 10:00 P. M.

EUGENE ROTH, *Secretary-Treasurer*

SAN FRANCISCO BRANCH

A regular meeting was held at the "Lucca's Restaurant", San Francisco, on September 11.

The meeting was called to order by MR. J. R. PATTENGER at 8:30 P. M.

Under new business the following names were submitted with completed applications for admission to the San Francisco Branch of the Society: DICK COEN, San Francisco; DANIEL J. GENTILE, Millbrae; JACK M. SAUNDERS, Sacramento, and BURTON I. TRYGSTAD, Redwood City. The above candidates for membership were voted in unanimously.

It was suggested by D. L. MAVIGLIA that the Branch set up a program to help members dispose of surplus equipment. Mr. Coen of L. H. Butcher said that his organization would be glad to help. He suggested that the members send the Secretary the information on the equipment and then a list could be compiled and sent to all members. He stated that L. H. Butcher in San Francisco would be glad to do the compiling and mimeograph work.

Our member, F. W. HUNTINGTON who is ill, was wished a speedy recovery in a note sent with a potted plant. The President appointed H. CORWIN JOHNSON as Chairman of the committee for planning meetings, with duties to arrange the time, place, menu and any other matters necessary. The speaker will be arranged for by the Librarian.

The meeting was then turned over to our local speaker, HORACE J. SMITH. He covered the subject of yellow brass plating, hitting on the theory and its application to practical brass plating. Copies of this talk will be available to the membership.

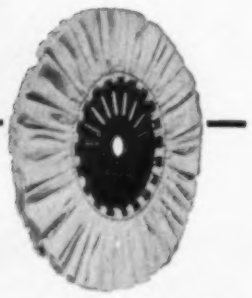
The meeting adjourned at 11:45 P. M., 21 members and visitors attending.

The October meeting of the San Fran-

A FEW OF THE MANY
FORMAX
PRODUCTS

STYLE C-20
CONTACT WHEELS
and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive felt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.



ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth or sisal mounted on safe steel centers. Available in a wide range of densities and center diameters.

A complete line of buffing compounds in bar form as well as in liquid form for brush or spray application. Also Flex-A-Glu polishing wheel cements.

Our Laboratory and Sales Engineering staff would welcome the opportunity to be of help in solving your finishing problems.

Send for descriptive literature

FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

MANUFACTURED IN CANADA BY JOHN GALLOWAY LTD., KITCHENER, ONT.

cisco Branch was held at the El Curtola Restaurant in Oakland, Calif.

The meeting was called to order by PRESIDENT J. R. PATTENGER, who introduced our speaker, DR. T. K. CLEVELAND, Chief Chemist, of The Philadelphia Quartz Company of California.

Dr. Cleveland's talk covered "Alkalies for Metal Cleaning". He accompanied his talk with short demonstrations which proved very interesting.

Mr. Pattenger then appointed a Christmas Party committee to carry out the following outlined program: To set the time and date with The Italian Village Restaurant; to make arrangements for a table near the floor show; and to take care of the other necessary arrangements. Committee as follows: Chairman, JACK HITE, C. R. OWENS and H. CORWIN JOHNSON.

At this point a short business session was held. Letters were read to the membership and only action taken was on the invitation to MR. WALTER PRINE of the International Nickel Company to speak before the Branch in March, 1953.

Three bills were voted paid.

Meeting was adjourned at 11:45 P. M.

H. J. SMITH, *Secretary*

SOUTHEASTERN BRANCH

On Friday, October 10, the Southeastern Branch assembled in Chattanooga, for what might be called their first one-day convention. After registration at 1:15 P. M. in the lobby of the Read House, a guided tour of the plant of the American Lava Corporation, was taken which proved very interesting to all in attendance.

At 8:30 P. M. after a delicious steak supper at the Signal Mountain Country Club, the meeting was called to order with 47 members present, M. E. AWTREY presiding. Out-of-town guests were as follows: MR. and MRS. R. A. FELLOWS, Detroit; DAVE GRIFFIN, Birmingham, Ala.; DR. and MRS. RUSSELL HARR, Chicago; BOB TAYLOR, Jacksonville, Fla.; C. N. SHEARER, LaGrange, Ga.; O. OLSEN, Pullman Company, Chicago; and from Atlanta: M. E. AWTREY, C. H. HOHNER, MR. and MRS. H. E. JENNINGS, WILLIAM F. KELLY, CLAUDE J. NALLEY, H. R. STOGNER, W. T. WEYMOUTH and CARLTON EDGE.

LIBRARIAN C. H. HOHNER introduced the first speaker of the evening, DICK FELLOWS, of Udylite, Detroit. He gave a very interesting talk describing new plating developments, touching lightly on all phases of plating. The next speaker, introduced by MR. FRANK O. BATES of the American Lava, was DR. RUSSELL E. HARR of Western Electric, whose subject was "Materials of Construction for the Plating Room". Some discussion followed with both speakers getting a big vote of approval. The meeting adjourned at 10:30 P. M. after a rising vote of thanks to members connected with the American Lava Corporation and to the corporation itself for a most enjoyable visit and meeting in its fair city.

W. T. WEYMOUTH,
Secretary-Treasurer

SYDNEY BRANCH

The 88th general meeting of this Branch was held at the Trust Building, King and Castlereagh Streets, Sydney, on November 13, with an attendance of 26 members and 24 visitors.

The following were elected to hold office for the financial year of 1953:

President—J. F. MURPHY
First Vice-President—B. W. ARMSTRONG
Second Vice-President—E. J. WRIGHT
Secretary-Treasurer—B. W. BRIDGEMENT
Board of Managers—W. H. MILLWARD, J. H. LEAN, E. MERRIMAN
Librarian—G. G. WHEEN

This meeting started in an unusual way by showing films before the general business and then finishing them after this had been dispensed with. These colour films showed REG. FACER'S tour of the world including the grandeur of the Rockies, the horrors of volcanic eruptions, the canals of Venice, the gay pageantry of England and Royalty, the cities of America and then back to Australia via Honolulu and the islands of the Pacific.

These films were accompanied by appropriate music which was handled by G. G. WHEEN.

B. BRIDGEMENT, *Secretary-Treasurer*

SYRACUSE BRANCH

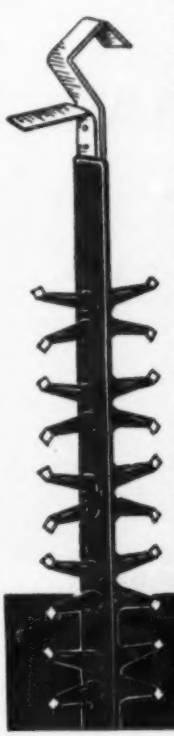
The 1953 season of the Branch started off with the third Mohawk Valley meeting held in Herkimer, N. Y., September 26.

Present was SUPREME PRESIDENT FRANKLYN MACSTOKER, who gave a talk,

NEW and BETTER INSULATION

The improved BUNATOL Paste is perfectly adapted for use on plating racks and on many other forms of equipment where its use will save time, cost and rejects.

Plating racks insulated for every kind of service; for coating anode baskets; conveyor hooks; material handling equipment; grids; dipping baskets; fans and fan housings; acid pails; buss bar shields; and even for making castings in simple molds without pressure; are some of the everyday uses of the improved BUNATOL Paste No. 1002.



BUNATOL Paste made in Red or Black has all the new improvements in plastisol manufacture plus the famous one-coat BUNATOL Primer which provides that continuous and lasting adhesion which permanently binds the thick Paste coating to the object. Superior performance by any method of comparison. Provides the last word in low cost insulation with less time and labor cost.

No. 1002 heat curing Paste is an extremely tough leather-like material (of any desired thickness) that will withstand all electroplating chemicals such as strong and hot alkalies and acids, and the usual cleaning solutions. Oftentimes the insulation will outlast the plating rack. It's 100% solids so there is no loss from evaporation.

May we send you complete information about BUNATOL Paste? A note on your letterhead is all that is necessary.

NELSON J. QUINN COMPANY
TOLEDO 7, OHIO

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 170.

the highlight being his surprise at finding another Democrat in this G. O. P. stronghold.

GEORGE SIMMONS, who lives in Herkimer and master minds these affairs, has always given the impression that Herkimer is known first for its nutcrackers made by the Quackenbush Company, and the plating that he does on them. He showed, via a color sound movie another very unique industry in that town, that of a company which makes model engines for airplanes. These little motors are held to unheard of tolerances. George does the plating on these parts (barrel plating, of course) and is held to tolerances in the millionths of an inch. The Quackenbush Company furnished entertainment by some of the Herkimer talent.

The one and only DAN GRAY, chief chemist of "Community Plate", gave one of his famous talks.

DR. WALTER MEYER gave a wonderful talk on derusting without acids, etc., illustrated with splendid slides.

Mention should be made of a few of the A. E. S. stalwarts who were on hand. The great fan dancer from St. Louis, B. G. DAW; the little boy from Elyria, Ohio, CLIFF WHEELER; George Simmons' old side-kick from Waterbury, Conn., BERT SAGE; M'AGATEEN in person who flew up from New York, BILL CHACE; BRUCE BELKE from Chicago and another one who is always there, BILL FOTHERINGHAM from Buffalo; DON BLUM and TY MOFFATT from Rochester; TED INFIELD down from G. E. in Schenectady, with five or six of his fellows.

Sincere thanks of the Branch go to Franklyn MacStoker, Supreme President, for making the trip; to Walter Meyer of Enthone for his splendid contribution to the evening's success; to Dan Gray of Oneida, Ltd.; to the Quackenbush Company for the entertainment and to all who made this a most successful affair.

One hundred and four A. E. S. members attended this meeting.

The October meeting was held at the Moose Hall on the 20th with 28 members and guests present. A Dutch Treat dinner of Swiss Steak was served those attending the dinner.

DR. HENRY L. KELLNER of the Lea Manufacturing Company of Waterbury, Conn., spoke on the subject of "Bright Copper Plating". The talk provided the members with a very interesting evening and Dr. Kellner answered many questions relative to the subject.

Refreshments were provided for by the Industrial Appliance Company of New York, L. S. Wood being the host.

LINDLEY S. WOOD, *Secretary*

TWIN CITY BRANCH

The Twin City Branch met on November 3 at 6:15 P. M. at the Pine Tavern in Minneapolis with 31 persons present.

BRANCH PRESIDENT JEROME M. WELLER of Minneapolis-Honeywell Regulator Company called the meeting to order following dinner at 7:00 P. M. and introduced the following guests: MESSRS. BOB PETERSON, SR. of Twin City Chromium Plating Company, Minneapolis; JACK WINTERS of R. O. Hull Company, Cleveland, Ohio, and CLIFFORD P. BARTH of Merchants Chemical Company who is transferring from the Cincinnati Branch to the Twin City Branch.

BRANCH LIBRARIAN FRED KAIM of Superior Plating & Rustproofing Company gave a short talk on the coming meetings for the balance of the year.

Following the business session, the program was turned over to Librarian Fred Kaim who introduced the speaker for the evening, Mr. Jack L. Winters of R. O. Hull Company, Cleveland, Ohio, who spoke on "The Hull Cell". Mr. Winters' talk, together with the presentation of slides on this subject, was of considerable interest for all present, and he was given a rising vote of thanks upon completion of his talk.

The meeting adjourned at 9:30 P. M.

ROBERT L. BUCKLEY,
Secretary-Treasurer

WATERBURY BRANCH

A regular monthly meeting was held October 9, at the Hotel Elton. SECOND VICE-PRESIDENT PERRY SLOANE presided and TED VOYDA was Technical Chairman. The attendance was gratifying and it is hoped that the change to Thursday evening will continue to be more convenient for everyone.

(*Continued on page 95*)

YOU CAN START RIGHT
EVERY TIME
WITH **PERMAG**

Cleaning tanks, so important to improved production and faster operation, are the first units in producing uniform work for a uniform plate.

Offering every advantage you seek for this work, PERMAG will leave your job chemically clean without damage to the metal and at a minimum cost for maximum cleaning efficiency.

Our technical service staff will gladly consult with you on any cleaning problem you may have, without obligation.

Write for your FREE Electroplaters' Handy Pocket Size Manual on Cleaning Compounds.

If you have trouble with:
HAZY DEPOSITS,
BLISTERS,
PEELING,
CARRY-OVER,
CORROSION or
SMUT ON STEEL
—let us help you.

MAGNUSON
PRODUCTS CORPORATION
50 Court Street • Brooklyn 2, N. Y.
In Canada:
CANADIAN PERMAG PRODUCTS, LTD., MONTREAL

You'll find H-VW-M BBZ-200 is an economical bright zinc process for barrel plating too. Your parts will not only look brighter, but they'll *stay* brighter longer, because they have higher resistance to oxidation and tarnish. In many cases subsequent bright dipping can be eliminated.

BBZ-200 is so easy to use. It develops brilliant deposits over a wide range of barrel plating conditions—has unusual tolerance for impurities—readily accepts conversion coatings—and can be soldered with relative ease. Then too, low concentration in the bath—plus low consumption—add up to real economy.

Bright zinc barrel plating with BBZ-200 is only one result of H-VW-M's constant progress for more than eighty years. It's a continuous policy, best summed up by the word Platemanship — your working guarantee of the best that industry has to offer, not only in plating processes, but in every phase of plating and polishing.

8656

Photo courtesy of H. L. Judd Co., Wallingford, Conn.

Sure BBZ-200 is a really bright zinc right out of the barrel

For full information on H-VW-M's BBZ-200 ask for Technical Instruction Bulletin.

Your H-VW-M combination — of the most modern testing and development laboratory — of over 90 years experience in every phase of plating and polishing — of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING CO., MATAWAN, N. J.
PLANTS AT: MATAWAN, N. J. • ANDERSON, INDIANA
SALES OFFICES: ANDERSON • BOSTON • CHICAGO • CLEVELAND
DAYTON • DETROIT • GRAND RAPIDS • LOS ANGELES • MATAWAN
MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH
ROCHESTER • SPRINGFIELD (MASS.) • STRATFORD (CONN.) • UTICA

H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

Membership Report of the A. E. S.

Elections

CHICAGO: Stanley G. Balinski, George F. Kersten, Walter R. Kostner

COLUMBUS: Lawrence E. Noll

DALLAS-FORT WORTH: James A. Glazener, Jr., Earle W. Halstead

DETROIT: John Bernard Bo, Hillard J. Jendrzynski, Warren L. King, Mitchell A. LaBoda

GRAND RAPIDS: Robert N. Burdick, Harry A. Davison, Donald De Fouw, Carl Lund, George C. Miller, D. A. Paull, Addison C. Snyder, Earl F. Taylor

HOUSTON: Sam L. Bishkin, Joe C. Brown, Theodore Y. Chapin, Richard L. Gavin, Harold M. Hill, Delford W. Lackey, Harry L. Mauzy, Michael Metrock, Perry J. Nicks, Roy J. Rogers

LOS ANGELES: Ike A. Baker, James M. Sowell

LOUISVILLE: Harvey R. Cross, Patrick Trifletti, Thomas J. Walsh

NEW HAVEN: Dr. Richard Springer

NEW YORK: Victor A. Gottlieb, Leif B. Nerheim, Samuel Ratoff

ROCHESTER: Walter Ketchmere, John De Zimm

SAN FRANCISCO: George Leghorn

SYDNEY: Alan F. B. Forbes

TWIN CITY: Howard R. Kittleson, Robert H. Peterson

MEMBER-AT-LARGE: Jacques L. Broad, Fort Lauderdale, Fla.; Uno Tragardh, Stockholm, Sweden; Dr. Wilhelm O. Pfanhauser, Austria; Monsieur Weller, France

Reinstatements

CHICAGO: Wilbert L. Berberick

COLUMBUS: Walter V. Hobbs

DETROIT: Stanley P. Sax

PHILADELPHIA: Harold S. Adams, Raymond C. Eckert, Chester W. Smith, Thomas Wallace

SYDNEY: E. Merriman, R. Wiles

Transfers

C. P. Barth from Cincinnati; Chester Borlet from Los Angeles to Detroit; John Gorman from Newark to Detroit; Wilbert G. Lidtke to Los Angeles from Detroit; Walter Nater to Dallas-Fort

Membership Competition

BRANCH	Membership Apr. 1, 1952*	New Members	Net Change in Membership	Per Cent Net Change
First Group				
Toronto	132	12	+12	+ 9.1
Milwaukee	145	15	+13	+ 9.0
New York	305	20	+18	+ 5.9
Newark	240	14	+10½	+ 4.4
Grand Rapids	155	12	+ 5½	+ 3.5
Detroit	491	31	+ 7	+ 1.4
Bridgeport	154	3	+ 1½	+ 1.0
Hartford	148	6	+ ½	+ 0.3
Pittsburgh	132	12	0	0
Boston	140	..	.....	.....
Cleveland	212	12	− 3½	− 1.7
Chicago	469	44	−10½	− 2.2
Los Angeles	218	3	−11	− 5.0
Melbourne†	168	18	− 9	− 5.4
Philadelphia	203	8	−14	− 6.9
Second Group				
Saginaw Valley	71	14	+14	+19.7
Rochester	88	22	+15	+17.0
New Haven	88	7	+ 8	+ 9.1
Montreal	72	7	+ 6	+ 8.3
Cincinnati	80	6	+ 6	+ 7.5
Syracuse	104	10	+ 1	+ 1.0
Buffalo‡	107	4	0	0
St. Louis	102	..	.....	.....
Waterbury	115	..	− 1½	− 1.3
Baltimore-Washington	96	5	− 2½	− 2.6
Dayton	81	7	− 3½	− 4.3
Sydney	86	5	− 4	− 4.7
Providence-Attleboro	92	4	− 5½	− 6.0
Indianapolis	114	3	−10	− 8.8
St. Joseph Valley	74	2	− 7½	−10.1
Rockford	79	3	−15	−18.9
Third Group				
Wichita	...	12 (19)	+12	+63.2
Louisville	24	15	+13	+54.2
Houston	40	10	+ 9½	+23.8
Western Ontario	19	8	+ 4	+21.1
Toledo	39	4	+ 7½	+19.2
San Francisco	67	11	+10	+14.9
Hamilton	22	3	+ 3	+13.6
Kansas City	...	4 (34)	+ 4	+11.8
Dallas-Fort Worth§	69	15	+ 7½	+10.9
Adelaide	58	6	+ 6	+10.3
Allentown-Reading	44	4	+ 4½	+10.2
Southeastern	47	13	+ 4½	+ 9.6
Springfield	55	3	+ 3	+ 5.5
Jackson-Lansing	59	4	+ 3	+ 5.1
Twin City	66	8	+ 2	+ 3.0
Lancaster	67	4	+ 2	+ 3.0
Columbus	54	7	− 1½	− 2.8
Outside Competition				
At Large	125	14	+14½	.....
In Transfer	23	..	.....	.....
Total A. E. S.	5,739	506	171.5	+ 3.0

Active Membership, November 30, 1952 5,911

*Subject to correction. †, ‡, §Winners in first, second and third group, respectively, of 1951–1952 membership competition.

Worth from Houston; Kenneth F. Greene from Cleveland to New York; William Laletin from Newark to New York; Fred Nobel from Newark to New York; Sam Rosenblatt from New York to Providence-Attleboro; Ray J. Dearth from Chicago to St. Joseph Valley

Resignations

NEW YORK: Sidney Gewertz

Suspensions

BRIDGEPORT: Rudolph F. Greiser, Fred L. Porter

ST. JOSEPH VALLEY: J. P. Borden, Ron Fiandt, George E. Nidy, Charles Sigler, Robert A. Simpson

SAN FRANCISCO: Granville T. Edmonds

CORRECTION: P. E. Friebis of the Columbus Branch was listed in the November issue under suspensions. This is in error. Mr. Friebis resigned.

Branch News

(*Continued from page 92*)

Inspired by a recent visit to ANSON BETTS, who is now operating a small manganese mine in Massachusetts, GEORGE DUBPERNELL reviewed the book, "Lead Refining by Electrolysis", written by Mr. Betts many years ago. This fine treatise by Mr. Betts is still an authoritative source of information on the subject and the process carrying the author's name is still extensively used in the mining industry. As the result of early papers on electrodeposition published in the Transactions of the Electrochemical Society he has been one of the foremost contributors to the science of electrodeposition.

In the absence of BILL STARR, Ted Voyda reviewed the plating supply situation and cheered the membership with news that Nickel Order M-80 has been amended so that nickel may be plated to .00005 inch under chromium. The catch to this is that no additional nickel has been allocated for the purpose.

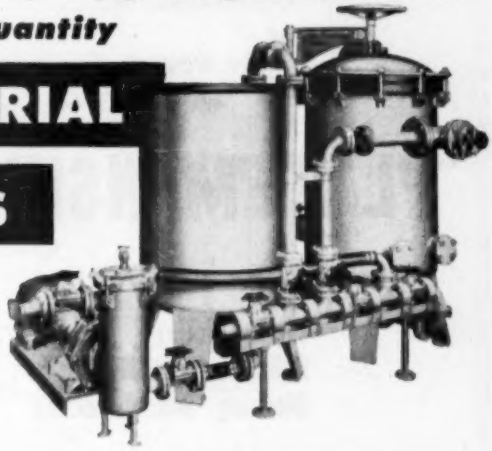
DR. RAYMOND J. KWASNIK, who operates the Aristol Company in Fairfield, talked on the subject, "The Finishing of Light Metals". As a specialist in the finishing of aluminum and magnesium alloys he was able to give us much practical information on the various methods of anodizing, passivating and coloring these metals. A beautiful display of parts aptly illustrated his talk.

S. L. HENN, *Secretary*

Bonus Performance

Filtering any plating solution . . . any quantity

INDUSTRIAL Filters



Portable and stationary models. Capacities from 100 to 15,000 gph. Special filtering systems engineered to meet unusual conditions.

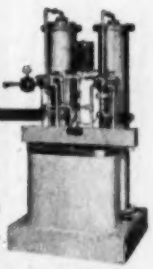
and it's performance that counts

The engineering, design, and construction of INDUSTRIAL filters have proved out in long service. With the outlet near the top of the chamber, a uniform precoat is deposited on the filter leaves as the solution fills the chamber. The outside lockup simplifies the lockup of the leaf and bag assemblies. INDUSTRIAL exclusive air-wash cleaning method practically eliminates the usual labor, downtime, and the inconveniences of dismantling the filter after each cycle. INDUSTRIAL filters are often in operation for months without removing the cover. All these features add up to bonus performance—clear filtrate at low over-all cost per gallon.

Ask for Bulletin 100-EP

This bulletin gives the complete details of all INDUSTRIAL features, description of the different standard models, and the capacities of the standard sizes.

INDUSTRIAL Water Demineralizers



Eliminate stains after hot rinses; prevent unwanted precipitates in solutions.

Standard INDUSTRIAL demineralizer units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.

Write for Full Information and Recommendations

INDUSTRIAL FILTER & PUMP MFG. CO.

5914 Ogden Avenue
Chicago 50, Illinois

FILTERS Pressure Type · PUMPS Centrifugal · CORROSION TESTING APPARATUS Salt Fog • Humidity

RUBBER DIVISION Vulcanized Linings • Molded Products · WATER DEMINERALIZERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 173.

BEAM-KNODEL CO.

Distributors for

HANSON-
VAN WINKLE-
MUNNING CO.'S

"PLATEMANSHIP"

A Complete Service

for **Electroplating, Polishing and Buffing, Cleaning and Anodizing**

195 LAFAYETTE STREET

CA 6-3956-7 New York 12, N. Y.

USE READER SERVICE CARD; INDICATE A 174.

BETTER COMPOUNDS *mean* **MORE PRODUCTION** *and* **INCREASED PROFITS**

Thirty years of experience developing and furnishing Polishing and Buffing Compounds to the Automobile Industry and hundreds of allied metalworking firms entitles us to solicit the opportunity of working on your polishing and buffing problems.

WRITE US TODAY

C. H. McAleer, President.

Detroit Chemical Specialties Inc.

101 S. WATERMAN DETROIT 17, MICH.

USE READER SERVICE CARD; INDICATE A 175.

A. E. S. Directory

A. E. S. OFFICERS

President.....F. J. MacSTOKER
Farrand Optical Company, Inc.
4401 Bronx Boulevard, Bronx, N. Y.

First Vice-President.....Dr. G. P. SWIFT
53 Galen Street, Watertown 72, Mass.

Second Vice-President.....Dr. R. A. SCHAEFER
Cleveland Graphite Bronze Company
17000 St. Clair Avenue, Cleveland 10, Ohio

Third Vice-President.....CLYDE KELLY
1519 Warren Boulevard, Chicago 7, Illinois

Past President.....C. F. NIXON
11-104 General Motors Research Building "A"
485 W. Milwaukee Avenue, Detroit 2, Mich.

Executive Secretary.....Dr. D. G. FOULKE
445 Broad Street, Newark 2, N. J.

A. E. S. RESEARCH COMMITTEE

Chairman.....Dr. DONALD PRICE
Oakite Products, Inc.
40 Thames Street, New York 6, N. Y.

Secretary.....The Executive Secretary

A. E. S. BRANCHES (Changes only)

HOUSTON meets third Tuesday of each month at 6:30 P. M. in the Ben Milam Hotel, Houston. Secretary-Treasurer, C. A. Mattiza, P. O. Box No. 9312, Houston, Texas.

LANCASTER meets second Friday of each month at 8 P. M. September, December and April meetings are held at Hanover, York and Harrisburg, respectively; all other meetings at the Old Mill Inn, Lancaster, Pa. Secretary-Treasurer, Harry A. Saylor, 40 N. Poplar Street, Elizabethtown, Pa. Research Finance Committee Chairman, Harry Hovis, Lincoln Highway, West Lancaster, Pa.

FOR SALE

Slightly Used BUFFS

Loose and Sewed
Air-Cooled

Any Quantity

MICHIGAN BUFF CO., INC.

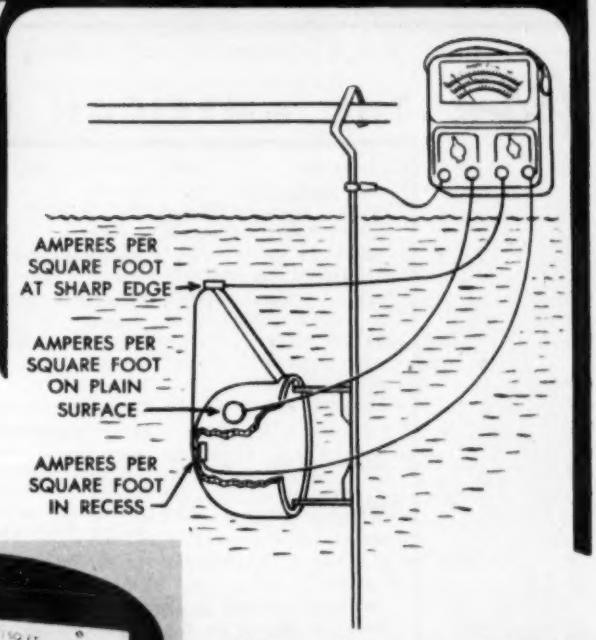
3503 GAYLORD AVE. DETROIT (12), MICHIGAN

USE READER SERVICE. CARD; INDICATE A176

Measure Current Density at the Plating Surface

Now you can know *what goes on at the plating surface* to save time and money a dozen ways! Know where you are plating too fast or too slow — instantly read current density at different points with the article in every conceivable position, with various voltages and with different solutions—check throwing power of the solution instantly without analysis or figuring.

The BELKE-KOTZ Current Density Meter is a veritable watch-dog against plating room waste. Enables you to utilize all your experience and skill in plating to specifications, speeding production, saving time, saving metal, eliminating rejects, etc.



BELKE-KOTZ Current Density Meter

Measures current density in amperes per square foot at desired points on the article under actual plating conditions.

Three test leads permit testing at three selected areas without moving test discs.

Nine scales—0-3, 15, 30, 75, 150, 300, 750, 1500, 3000 amperes per square foot assure sharp readings in any range.

Disc Contacts and Range Selector Switches permit instant reading of current density at any test point on any scale.

Patent Pending

Simple as ABC

With the BELKE-KOTZ Current Density Meter it's easy to know instantly what goes on at the plating surface under any condition.

Just attach a test disc at each of three selected areas on the article.

- Position the article in the tank.
- Connect Meter to cathode. Turn switches and read current density at each of the three test areas.
- You can reposition article, doctor solution, or change voltage and read current density quickly until you get the best combination of position, solution and voltage.
- No figuring. Meter is calibrated in amperes per square foot. You can compare the reading with current density tables for the solution you are using.

Ask your BELKE Service Engineer for particulars or send for literature.

Helps 6 important ways—

1. Enables you to instantly compute plating time for any metal thickness at any point on any article.
2. Shows best position for the article.
3. Shows when auxiliary anodes are needed.
4. Shows when burning bars are needed.
5. Shows when voltage is too high or too low.
6. Shows change in solution throwing power.

Belke MANUFACTURING CO.
947 N. Cicero Ave.
Chicago 51, Ill
EVERYTHING FOR PLATING PLANTS

RESEARCH PUBLICATIONS *Available*

from THE AMERICAN ELECTROPLATERS' SOCIETY

Year	*Research Paper No.*	*Price, cents*	*Title*	*Authors*
1929	72	10	The spotting of plated or finished metals	W. P. Barrows
1931	368	10	Porosity of electroplated chromium coatings	W. Blum, W. P. Barrows & A. Brenner
1934	712	10	Protective value of nickel and chromium plating on steel	Strausser & A. Brenner
1934	734	5	Accelerated tests of nickel and chromium plating on steel	P. W. C. Strausser, A. Brenner & W. Blum
1936	867	5	Corrosion-protective value of electrodeposited zinc and cadmium coatings on steel	W. Blum, P. W. C. Strausser & A. Brenner
1940	1293	5	Outdoor exposure tests of electroplated nickel and chromium coatings on steel and nonferrous metals	W. Blum & P. W. C. Strausser
1945	1645	10	Methods of polishing steel and their effects upon the protective value of electroplated coatings	G. A. Lux & W. Blum

SERIES "B"

Publications originally appearing in THE MONTHLY REVIEW and PLATING, reprint of which may be obtained from the office of the Executive Secretary, 445 Broad Street, Newark 2, N. J., at the prices listed.

Year	*Reprints Serial No.*	*Price, $*	*Title*	*Authors*
1946	1	0.60	Adhesion of Electrodeposits, Parts I, II, and III	A. L. Ferguson & E. F. Stephan
1946	2	0.40	Adhesion of Electrodeposits, Part IV	A. L. Ferguson
1947	3	0.50	Determination of Impurities in Electroplating Solutions, Parts I–VI	E. J. Serfass & W. S. Levine
1947	4	0.35	Stripping of Copper from Various Base Metals, Parts I and II	F. C. Mathers, C. E. Landwerlen & E. L. Martin
1949	6	1.25	Determination of Impurities in Electroplating Solutions, Parts VII–XIV	E. J. Serfass and Coworkers
1948	9	0.75	Disposal of Plating Room Wastes	B. F. Dodge & D. C. Reams, Jr.
1949	14	1.00	Disposal of Plating Room Wastes	B. F. Dodge & D. C. Reams
1950	15	0.90	Effect of Impurities and Purification of Electroplating Solutions	D. T. Ewing & W. D. Gordon
1950	16	1.00	Determination of Impurities in Electroplating Solutions, Parts XV–XIX	E. J. Serfass & Coworkers
1950	17	1.00	Porosity of Electrodeposited Metals	N. Thon, Denis Kelemen & Ling Yang
1951	18	1.65	Cleaning and Preparation of Metals for Electroplating	H. B. Linford & E. B. Saubestre
1952	19	0.65	Analytical Methods for the Determination of Cyanides and Cyanates in Plating Wastes and in Effluents from Treatment Processes	B. F. Dodge, W. Zabban, E. J. Serfass & R. B. Freeman
1952	20	1.25	Physical Properties of Electrodeposited Metals	A. Brenner, V. Zentner & C. W. Jennings
1952	21	1.30	Polarization and Overvoltage	R. A. Schaefer & W. King

TECHNICAL DIRECTOR—CHIEF CHEMIST—ENGINEER—A. E. S. MEMBERS

Review your file of A. E. S. Research Reports and bring it up-to-date now. Simply check on the list above those you need and send your check for the total to:

AMERICAN ELECTROPLATERS' SOCIETY • 445 Broad Street, Newark 2, N. J.

Index to Advertisers

ALLIED RESEARCH PRODUCTS, INC. 6, 89
Agency: Emery Advertising Corporation

ALMCO DIV., QUEEN STOVE WORKS, INC. 68
Agency: Weston-Barnett, Inc.

ALSOP ENGINEERING CORPORATION 13

AMERICAN BUFF COMPANY 70
Agency: Burlingame-Grossman, Adv.

AMERICAN CHEMICAL PAINT COMPANY 8
Agency: May Advertising Company

AMERICAN ELECTROPLATERS' SOCIETY 98

AMERSIL COMPANY, INC. 100
Agency: Mercready, Handy & Vandenburgh

M. E. BAKER COMPANY 37

BAKER & ADAMSON PRODUCTS, GENERAL CHEM. DIV., ALLIED CHEM. & DYE CORP. 19
Agency: Atherton & Currier

BART-MESSING CORPORATION 67
Agency: Bass & Company, Inc.

BEAM-KNODEL COMPANY 96

BECKMAN INSTRUMENTS, INC. 35
Agency: Dozier, Eastman & Company

BELKE MANUFACTURING COMPANY 97
Agency: Allbright Associates

BETTER FINISHES & COATINGS, INC. 18
Agency: James J. McMahon, Inc.

BUCKINGHAM PRODUCTS COMPANY 17
Agency: Dudgeon, Taylor & Bruske, Inc.

THE CHEMICAL CORPORATION 37
Agency: Wm. B. Remington, Inc.

CHEMSTEEL CONSTRUCTION CO., INC. 72
Agency: Smith, Taylor & Jenkins, Inc.

COLUMBIA ELECTRIC MANUFACTURING CO. 18
Agency: Meermans, Inc.

COWLES CHEMICAL COMPANY 34
Agency: The Bayless-Kerr Company

CROWN RHEOSTAT & SUPPLY COMPANY 15
Agency: Shrout Associates

DANIELS PLATING BARREL & SUPPLY CO. 30
Agency: Asher, Godfrey & Franklin, Inc.

DAVIES SUPPLY & MANUFACTURING CO. 87
Agency: Batz-Hodgson-Neuwoehner Adv. Agency

THE DAYTON BRIGHT COPPER COMPANY 68

DETROIT CHEMICAL SPECIALTIES CO. 96

DUGGAN MASKING DEVICES 72
Agency: James E. Lillis Advertising Agency

ENTHONE, INCORPORATED 3
Agency: Hugh H. Graham & Associates, Inc.

FIDELITY CHEMICAL PRODUCTS CO. 74
Agency: Art-Copy Advertising Agency

FORMAX MANUFACTURING COMPANY 90
Agency: Brindley-Roth, Inc.

GLO-QUARTZ ELECTRIC HEATER CO. 66

W. GREEN ELECTRIC COMPANY 50-51
Agency: Shappe-Wilkes, Inc.

FREDERICK GUMM CHEMICAL CO., INC. ..... 2nd Cover

HANSON-VAN WINKLE-MUNNING CO. ..... 93, 4th Cover
Agency: O. S. Tyson & Company, Inc.

THE HARSHAW CHEMICAL COMPANY 40

HOUGHTON LABORATORIES, INC. 23
Agency: Walker & Downing Advertising

R. O. HULL & COMPANY, INC. 75
Agency: Ralph M. French Advertising

INDUSTRIAL FILTER & PUMP MFG. CO. 95
Agency: The Advertising Corporation

INDUSTRIAL PRODUCTS COMPANY 66
Agency: The Stewart-Jordan Company

KOCOUR COMPANY 16
Agency: DeCasseres & Associates

JOSEPH B. KUSHNER 68

LAND, L. J., INC. 69

THE LEA MANUFACTURING COMPANY 71
Agency: Sanger-Funnell, Inc.

LEA MFG. COMPANY OF MICHIGAN 82
Agency: Sanger-Funnell, Inc.

CHARLES F. L'HOMMEDIEU & SONS CO. 9

MAC DERMID, INCORPORATED ..... 3rd Cover
Agency: Harold F. Lewis

MAGNUS CHEMICAL COMPANY 86
Agency: Spooner & Kriegel

MAGNUSON PRODUCTS CORPORATION 92
Agency: Asher, Godfrey & Franklin, Inc.

THE MEAKER COMPANY 4
Agency: The Advertising Corporation

MICHIGAN BUFF COMPANY, INC. 96

MICHIGAN CHROME & CHEMICAL CO. 7

J. C. MILLER COMPANY 73
Agency: James Philip Reed

MITCHELL-BRADFORD CHEMICAL CO. 49
Agency: Langeler Advertising Agency, Inc.

MUTUAL CHEMICAL CO. OF AMERICA 14
Agency: The House of J. Hayden Twiss

NANKERVIS COMPANY, GEORGE L. 32
Agency: Charles M. Gray & Associates

NATIONAL RACK COMPANY 76
Agency: John Philips Advertising Company

NEW HOLLAND MACHINE COMPANY 12
Agency: J. Walter Thompson Company

NOBLES ENGINEERING & MFG. COMPANY 81

NORTHWEST CHEMICAL COMPANY 52
Agency: H. B. Hubert Advertising

OAKITE PRODUCTS, INC. 69
Agency: Rickard & Company

PERMAG CORPORATION 88
Agency: Joseph P. Schneider, Inc.

PROMAT DIV., POOR & COMPANY 79
Agency: Russell T. Gray, Inc.

NELSON J. QUINN COMPANY 91
Agency: Wendt Advertising Agency

N. RANSOHOFF, INC. 26
Agency: The Chester C. Moreland Company

SARCO COMPANY, INC. 27
Agency: Gus Binz Associates

SCHAFFNER MANUFACTURING CO., INC. 25
Agency: Edward M. Power Company, Inc.

E. E. SEELEY COMPANY. INC. 100

SEL-REX PRECIOUS METALS, INC. 24
Agency: Bass & Company

SETHCO 100
Agency: Harry Hurst Advertising

THE SEYMOUR MANUFACTURING CO. 31
Agency: Claude Schaffner Advertising Agency

SPARKLER MANUFACTURING COMPANY 22
Agency: Kreicker & Meloan, Inc.

STANDARD ELECTRICAL TOOL COMPANY 28
Agency: Strauchen & McKim

STEVENS, FREDERIC B., INC. 38
Agency: Grant Advertising, Inc.

STORTS WELDING COMPANY, INC. 63
Agency: Harold S. Card

STUTZ, GEORGE A., MANUFACTURING CO. 77
Agency: Sander Rodkin Advertising Agency, Ltd.

SULPHUR PRODUCTS COMPANY, INC. 70

TITEFLEX 5
Agency: John Falkner Arndt & Company

TRUE BRITE CHEMICAL PRODUCTS CO. 14

THE UDYLITE CORPORATION 85
Agency: Grant Advertising, Inc.

UNIT PROCESS ASSEMBLIES, INC. 72
Agency: State Advertising Service

UNITED CHROMIUM, INCORPORATED 65
Agency: Rickard & Company, Inc.

WAGNER BROTHERS, INC. 10-11
Agency: Fred P. Bingham, Technical Adv.

WYANDOTTE CHEMICALS CORPORATION 20-21
Agency: Brooke, Smith, French & Dorrance, Inc.

For Proof of Value
In
ALL METAL FINISHING
Check
Seeley Compounds

Bar { BURRING / POLISHING / BUFFING } Liquid

E. E. SEELEY COMPANY, INC.
Bridgeport, Conn.

USE READER SERVICE CARD; INDICATE A 178.

Future Meetings

INTERIM MEETING OF THE SUPREME SOCIETY, A. E. S., January 10, 1953 at 10:00 a.m., Neill House, Columbus, Ohio.

BALTIMORE-WASHINGTON BRANCH, A. E. S., Annual Educational Session (afternoon) and Dinner Dance (evening) at the Statler Hotel, Washington, D. C., on January 17, 1953.

PLANT MAINTENANCE CONFERENCE AND SHOW sponsored by the A. S. M. E. and the Society for the Advancement of Management at the Public Auditorium, Cleveland, Ohio, January 19–22, 1953.

GRAND RAPIDS BRANCH, A. E. S., Annual Educational Session (2:00 P. M.) and Banquet (7:00 P. M.) at the Pantlind Hotel on January 24, 1953.

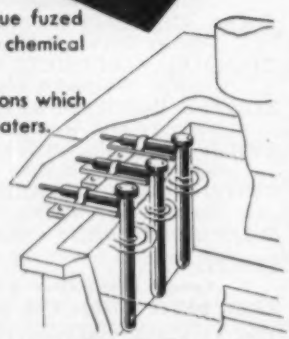
CHICAGO BRANCH, A. E. S., Annual Banquet and Educational Session at the Conrad Hilton Hotel on January 31, 1953.

NEW YORK BRANCH, A. E. S., Annual Educational Session (2:00 P. M.) and Banquet (7:00 P. M.) at the Hotel Statler on February 14, 1953.

CINCINNATI BRANCH, A. E. S., Educational Session and Dinner Dance at the Sheraton-Gibson Hotel on March 28, 1953.

for SAFE·SURE·FASTER HEATING IN CRITICAL PROCESSES
Amersil IMMERSION HEATERS

—are protected, in an opaque fuzed quartz shell, against corrosive chemical fluids.
This permits use under conditions which inhibit the use of other type heaters.



NOTE THESE FEATURES

- High rate of heat transfer
- Acid resistance
- Quicker warm-up
- Closer control of bath temperatures
- Immunity to thermal shock
- Compact design

Bulletin IH gives complete details

Amersil Company, Inc.
1471 Chestnut Ave., Hillside 5, N. J.
2024

FILTER 50-1500 GAL/HR ANY ELECTROPLATING SOLUTION
NO ROUGH DEPOSITS
NO PITTING

Model LSI-10
Cap. 100 gal/hr
H.T. Lucite Filter Assembly
Portable, Wt. 40 lb.
12"x16"x16"

SETHCO FILTER PUMP LSI-10

- Filter solutions from ph 0 to ph 14.
- No loss of precious solutions.
- Stainless Steel (316) or Hastalloy Pump and Fittings.
- H. T. Lucite, Stainless (316), Rubber-lined, Haveg or Sethrin* Resin Filter Assemblies.
- Cotton, Dynel, Orlon, Nylon, Spun Glass, Porous Stone or Porous Carbon Filter Tubes.

*Reg. App. for

Write for literature

Sethco
72 Willoughby Street
Brooklyn 1, N. Y.
Representatives in All Principal Cities

MAC DERMID INCORPORATED

Metal Finishing Calendar for 1953

JANUARY

S.	M.	T.	W.	T.	F.	S.
-	-	-	-	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
-	-	-	-	-	-	-

FEBRUARY

S.	M.	T.	W.	T.	F.	S.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
-	-	-	-	-	-	-
-	-	-	-	-	-	-

MARCH

S.	M.	T.	W.	T.	F.	S.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	-	-	-	-
-	-	-	-	-	-	-

APRIL

S.	M.	T.	W.	T.	F.	S.
-	-	-	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	-	-
-	-	-	-	-	-	-

* METEX ZINC STRIPPER
* DYCLENE "E" — Reverse current cleaner for die casting

* ANODEX — Reverse current cleaner for steel
* MACDERMID BRIGHT COPPER PLATING PROCESS

MAY

S.	M.	T.	W.	T.	F.	S.
-	-	-	-	-	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	-	-	-	-	-	-

JUNE

S.	M.	T.	W.	T.	F.	S.
-	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	-	-	-	-
-	-	-	-	-	-	-

JULY

S.	M.	T.	W.	T.	F.	S.
-	-	-	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	-
-	-	-	-	-	-	-

AUGUST

S.	M.	T.	W.	T.	F.	S.
-	-	-	-	-	-	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	-	-	-	-	-

* ROCHELTEX — For copper plating
* CHROMETEX — Nickel activator

* TROXIDE — Dry acid pickling salt
* METEX FILTER POWDER

SEPTEMBER

S.	M.	T.	W	T	F.	S.
-	-	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	-	-	-
-	-	-	-	-	-	-

OCTOBER

S.	M.	T.	W.	T.	F.	S.
-	-	-	-	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
-	-	-	-	-	-	-

Don't Forget-

Write for free data sheets on these items, or request complete catalogue, listing technical information on all of our products.

* MACDERMID ALUMINUM BRIGHT DIP
* PHOSPHOTEX — Zinc phosphate process

NOVEMBER

S.	M.	T.	W.	T.	F.	S.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	-	-	-	-	-
-	-	-	-	-	-	-

DECEMBER

S.	M.	T.	W.	T.	F.	S.
-	-	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	-	-
-	-	-	-	-	-	-

* NICKELEX STRIPPER — For stripping nickel deposits from steel bases

MAC DERMID
Incorporated
WATERBURY 20, CONNECTICUT

Thirty Years Service to The Metal Finishing Industry

I'll tell you why . . . because they're designed to take all the punishment of mass-production plating—and last far longer. Hanger assembly is built extra rigid to reduce maintenance. It slips right into those new-type saddle brackets on the tank for extra strong support plus greater ease in handling. That's a typical H-VW-M performance-proved feature.

And no matter what the plating problem there's an H-VW-M Mercil Type Cylinder built for the job. For example . . . Plexiglas, with ribless, one-piece, convex panel construction—ideal for temperatures to 180°F. . . . or Melamine, for use in temperatures to 210°F. Every type is available in a wide variety of sizes—with a broad choice of contacts—in addition to the standard flexible dangler. Individual motor drive is standard equipment, although bevel-gear drive is available if desired. You'll get a better plated product from these barrels—a more uniform deposit—*much more economically.*

Plating barrels are just one of many results of over eighty years of constant plating development — a continuing policy summed up in H-VW-M Platemanship . . . your working guarantee of the best that industry has to offer— not only in plating barrels—but in every phase of plating and polishing.

8655

Photo courtesy of H. L. Judd Co., Wallingford, Conn.

For full information on H-VW-M Mercil Type Plating Barrels ask for Bulletin PB-108.

Your H-VW-M combination — of the most modern testing and development laboratory — of over 80 years experience in every phase of plating and polishing — of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING CO., MATAWAN, N. J.
PLANTS AT: MATAWAN, N. J. • ANDERSON, INDIANA
SALES OFFICES: ANDERSON • BOSTON • CHICAGO • CLEVELAND
DAYTON • DETROIT • GRAND RAPIDS • LOS ANGELES • MATAWAN
MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH
ROCHESTER • SPRINGFIELD (MASS.) • STRATFORD (CONN.) • UTICA

H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 182.